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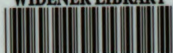
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PROCEEDINGS

OF THE

AMERICAN SOCIETY

OF

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(INSTITUTED 1852.)

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# American Society of Civil Engineers.

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## PROCEEDINGS.

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Vol. VIII.—January, 1882.

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## MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

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### OF THE SOCIETY.

**JANUARY 4, 1882.**—The Society met at 8 p. m. Vice-President Welch in the Chair. Ballots were canvassed, and the following candidates declared elected : As Members, Onward Bates, Dardenne, Mo.; William Wingfield Bonny, Montreal, Canada; Samuel L. Felton, Jr., Columbus, O.; Charles E. Greene, Ann Arbor, Mich.; Thomas W. Jaycox, Leadville, Col.; Mirtiliano Sicard, Ibagu, U. S. of Colombia. As Associate, George Henry Frost, New York. As Juniors, James Peter Bogart, New Haven, Ct.; Arthur Haviland, Jalisco, Mexico.

Messrs. Bogart, Dresser, Emery, Wm. H. Paine and C. V. Smith were appointed a committee to arrange details for the Annual Meeting on the 18th inst.

Illustrations forwarded to the Society by Charles O. Gleim, Cor. Member, A. S. C. E., of the iron cross-ties and sleepers now in use on the Prussian Government Railroads, were presented by the Secretary, and the subject discussed.

## THE ANNUAL MEETING.

JANUARY 18, 1882.—The Society was called to order, in Annual Meeting, at 10 A. M. Vice-President Ashbel Welch, in the Chair, and present also the Members whose names are given in a list subjoined.

Edward A. Doane and James Owen were appointed tellers of the ballots to be canvassed.

The Annual Report of the Board of Direction, the Annual Report of the Treasurer, and the Report of the Finance Committee were presented, read by the Secretary, and accepted.

A report by the Committee on a Uniform System for Tests of Cements, was read, accepted, and the Committee continued.

## REPORT OF THE COMMITTEE ON A UNIFORM SYSTEM FOR TESTS OF CEMENTS.

The Committee appointed for the purpose of devising a uniform system for tests of cements, report that but little has been done during the last year towards the accomplishment of their duty, owing first, to the inability of its Chairman to give the requisite time to the subject, on account of domestic afflictions and his pressing professional duties as Chief Engineer of the Chicago, Milwaukee and St. Paul Railway; and secondly, for the reason that the Members of the Society have not responded, excepted in two instances, to the call of the Society for samples of American sand for experimental examination by the said Chairman. To devise uniformity of tests of mortars composed of cement and sand, requires each experimenter to have sand of about the same characteristics, therefore, in specifying the quality of sand to be used for test purposes, the Committee should recommend such as may readily be procured in all parts of the country, if possible.

In conclusion, I would respectfully request that the Secretary be requested to issue a circular to Members, calling their attention to the subject, and requesting samples of sand from, say 30 to 40 different localities, properly distributed, so that when received the same shall represent fairly the quality in each locality.

Respectfully submitted,

D. J. WHITTEMORE,

*Chairman.*

The Secretary presented the canvass of suggestions by Members as to the place for the next Convention of the Society, viz.: Washington, 48; San Francisco, 16; Chicago, 8; St. Paul, 4; New York, 3; Baltimore, 2; New Orleans, 1; Boston, 1; Denver, 1; Atlanta, 1; Pittsburgh, 1; Milwaukee, 1; Richmond, 1; Buffalo, 1; St. Louis, 1; Cleveland, 1; Louisville, 1; Minneapolis, 1; Troy, 1; Yellow Stone Park, 1; White

Sulphur Springs, 1 ; Some City on the Mississippi, 1 ; Leon, Mexico, 1. On motion, it was resolved that the Convention be held at Washington, D. C., and the Board of Direction was requested to determine and announce the date.

The tellers presented the canvass of the ballot for officers, and the following Members were declared elected as officers of the Society for the ensuing year :

*President* :—ASHBEL WELCH.

*Vice-Presidents* :—JAMES B. EADS, WILLIAM H. PAINE.

*Secretary and Librarian* :—JOHN BOGART.

*Treasurer* :—J. JAMES R. CROES.

*Directors* :—THOMAS C. KEEFER, THOMAS L. CASEY, JOSEPH P. DAVIS, GEORGE S. GREENE, JR., GEORGE W. DRESSER.

Remarks of Mr. ASHBEL WELCH on taking the Chair, upon his election as President of the American Society of Civil Engineers, January 18, 1882.

I take this occasion to return my thanks to the members of the American Society of Civil Engineers, present and absent, for the honor they have conferred on me by choosing me for their president. And I desire to express my appreciation of the honor thus conferred of being first in place in this Society, which comprises so many of the most eminent engineers in the United States and Canada, including several of the most distinguished officers of the army and navy of the United States, and including, also, engineers in every quarter of the civilized world. Among the applications for admission which we have received within the last few months, some were from the remotest States of the American Union, about half a dozen were from Canada proper, one was from the British province of New Brunswick, three from Mexico, one from the United States of Columbia, one from the Republic of Chili, one from England, and one from India beyond the Ganges. Thus our Society, and the works executed by its members, are among the ties that are uniting the nations of the earth into one family.

But it is not only or mainly the number and eminence of its members, and the vast territory whose engineering they largely represent, which make the distinctions conferred by this Society so honorable, but it is especially the character for integrity and high-toned professional honor which pervades the Society, and which has gained for it universal respect.

Much of the advantage of being a member of this Society comes from the presumption it raises of professional integrity as well as professional skill. The office of engineer is largely judicial. He is arbiter between proprietor and contractor. His hand is on the purse-strings. What the capitalist wants is that the engineer whom he entrusts to ex-



pend his money and do his work, shall do it honestly as well as skilfully. The contractor wants to feel sure that the engineer, into whose power he puts himself when he signs the contract, will do him justice. No responsible contractor will bid for work under an engineer whom he does not suppose to be honest, except at a high price. Thus the cost of a work may be very much affected by the character as well as the ability of the engineer.

As in all offices of trust, the engineer is paid not only for his labor and skill but for his character for integrity.

In order that the endorsement which membership of this Society gives should be as valuable as possible, their own reputation should be carefully guarded, not by legislation or regulations, not by censorship, but by the caution and firmness and honor of those who are asked to recommend candidates for admission, and by the pressure of a wholesome professional public sentiment similar to that which preserves the purity of the bench, and of the army and navy.

The Board of Censors, to award the Norman Medal, reported that in consequence of the illness of one of their number, their duties were not yet completed. Leave was granted to this Board to report at a subsequent meeting of the Society.

The report of the Committee on a Uniform Standard of Time was presented through the Chairman, Mr. Sandford Fleming, as follows :

The Committee appointed to consider the paper on Standard Time, for Railway and other purposes, read at the Montreal Convention, June, 1881, beg leave to report :

#### REPORT OF THE SPECIAL COMMITTEE ON STANDARD TIME.

The Committee have examined the question referred to them, and fully recognize its great public importance. Practically it resolves itself into a proposition to reform our general time system. But difficulties of a peculiar nature present themselves. The Committee does not consider the problem insolvable ; but from its character it is clear that no single association, and that no one individual can solve it. Every member of society is interested in it, and it becomes necessary to consult many interests in order that general concurrence in any change be obtained.

Since the subject was brought under the notice of the Society in June last it has been taken into consideration by other associations : by the American Association for the Advancement of Science, at Cincinnati ; by the American Metrological Society, in New York ; by the Association for the Reform and Codification of the Law of Nations, at Cologne, Prussia ; by the International Geographical Congress, at Venice, Italy.

The members of the Committee have, since their appointment, conferred individually with many persons. They find it admitted on all sides that standard time for general use throughout the country is urgently demanded, and that the time has arrived when action should be taken.

That the question is one of importance, it is only necessary to glance at the existing condition of our time service. Mistakes in the hour of the day are frequent. In every city or town—in every State—discrepancies are met which produce great aggregate inconvenience. Thousands of engagements are broken. Innumerable disappointments and losses result. In some cases loss of life is caused, and generally in consequence of defects in our time system, difficulties more or less serious constantly are experienced.

These difficulties are not confined to this country. They are experienced in all civilized communities where lines of rapid communication have been established. In the papers before the Committee it is urged that the question is one which affects every nationality, and therefore any change which may be proposed for this country should be such as to commend itself to other nations for adoption, so as ultimately to become universal.

The time system which we follow has been in use for centuries. It certainly answered all the purposes of mankind when there were no railways, no steamboats, and no telegraphs. In some respects the general advancement of civilized communities has outgrown the old custom: the yearly march of events more and more rendering it obsolete, and calling for reform to meet the condition of the age in which we live.

The Committee anticipate difficulty in effecting a desirable reform as no change in a matter of this kind can be effected without interfering in a greater or less degree with long established usages and fixed habits of thought. The importance of the question, however, appears to the Committee to justify a united effort to obtain as complete a reform as may be desirable and possible.

The Committee feels assured that the general intelligence of the Community will cordially sympathize with an earnest movement to bring about such modifications in our time system as may be practicable and beneficial.

The people of the old world are influenced by traditional customs, and generally are attached to usages on account of their antiquity. They may adhere even to imperfections,—which years have made venerable. On this continent this feeling is modified. Americans are not, to the same extent, disposed to cling to conventional forms when these forms interfere with public convenience, or when they retard progress. It is, therefore, clear to the committee that we cannot remain passive until other nations take the initiative in Time reform. For in this country the imperious power of custom is less difficult to overcome.

If it be considered that the initiation of such a time system as the age demands properly falls within the province of the people of America, it becomes the more necessary that we should make earnest efforts to ascertain what best will meet the requirements of the hour, and prove most generally beneficial to our own generation and those which follow us.

The Committee holds it expedient to obtain an expression of opinion on the various points which present themselves, from as large a number of practical and scientific men as possible. They consider it essential to have the views of those who have been and are now engaged in connection with the great lines of transportation in every State, and Province between the two Oceans.

Accordingly the Committee begs leave to recommend that such papers on Standard Time as they may consider necessary to set forth the subjects, be printed, and, all who are prominently connected with Railway and Telegraph enterprises, or are in any way interested in the consideration of the question in the United States, in Canada, and in Mexico, be cordially invited to send replies to the series of questions which have been prepared, with the view of obtaining all shades of opinion.

The Committee more particularly draw attention to propositions 13 to 20 in the scheme which accompanies this.

It has been held by those who have given attention to the subject that no scheme of time reform can be considered complete without provision for the ultimate removal of a defect familiar to many. The Committee accordingly direct attention to the suggestions submitted under the heading "Divisions of the day into hours."

The Committee respectfully recommend that authority be granted by the Society to invite the co-operation of other scientific associations, and that of other bodies in the furtherance of this important object, and that all such Societies and government departments interested be invited in the name of the Society to attend a general convention to meet at New York or Washington on a day hereafter to be named, for the purpose of determining the Time System advisable to adopt.

SANDFORD FLEMING,

*Chairman.*

On motion, the report was accepted.

The following resolutions, offered by Mr. William G. Hamilton, were adopted :

Moved by Mr. W. G. Hamilton.

Seconded by Mr. Worthen.

*Resolved*, That the report of the Special Committee on Standard Time be accepted ; and that the Committee are hereby requested to take such steps as they may consider necessary to obtain information to enable them to report definitely at a future meeting.

*Resolved*, That authority is hereby given to the Committee to co-operate with other associations in furtherance of this important subject.

*Resolved*, That authority is hereby granted to the President of this Society to invite other societies interested, and that representatives of the State Governments, representatives of the Dominion of Canada, the Republic of Mexico, and the various departments of the General Government at Washington, be invited to meet in a convention, as set forth in the report.

Gen. T. G. Ellis, member of the Committee, said :

Mr. PRESIDENT : I am requested to say something of what was spoken of in the meeting of the Committee on Standard Time. We had present with us at the meeting Prof. Cleveland Abbe, who is connected with the Signal Service, and he made some statements as to what the Government is doing in Washington.

They have proposed to set up a standard clock in the basement of one of the buildings in Washington, to keep, as nearly as possible, the exact time. The clock is to be manufactured by the Waltham Company, in Massachusetts, and will be ready for delivery some time in February. The clock is to be as fine and well constructed as possible. They propose to set it up where the temperature will not vary more than one degree in the year. They have been in the habit of receiving time signals from all the principal observatories in the country, and these vary from one to ten seconds in their estimate and computation of what is known as Washington time ; they receive these signals now. They propose when this clock is up to receive these signals and return to these observatories what the actual time is. Then these different observatories will both receive and transmit the signals from different places, so as to give the exact mean time. And they propose, whether anything is done or not by this Society, to establish a standard and uniform time for the Signal Service ; they intend to do that irrespective of other arrangements. Prof. Abbe says that there have been arrangements made for the Mail Service and other services to have everything done upon a uniform standard of time. There seems to be a disposition at Washington to establish a uniform standard of time, and do away with local time. I think if other societies or other bodies do not take some step in it, that the subject may be presented to Congress, and some wrong step may be made, so that this Committee, in view of all the circumstances and of what has been done and what has been proposed, thought it would be an excellent plan to correspond with the departments and get at their views before making any definite recommendation.

The Committee on Preservation of Timber reported, through Vice-President Chanute, Chairman of the Committee, that very few answers had been received to the circulars heretofore issued, and that the committee proposed seeking further information upon the subject, and hoped to present a report at the next convention.

The Committee was continued.

Proposed amendments to the Constitution were then discussed.

**Proposed amendment to Article XXII.**

Add at end of the article, as follows:

Any member or associate, whose subscription is not in arrears, may compound for future annual subscriptions by the payment of three hundred dollars, if he is a resident, and of one hundred and fifty dollars, if he is a non-resident. But should a non-resident become a resident he shall pay the remainder of the composition, viz., one hundred and fifty dollars, or the usual annual subscription during the time of his residence.

Mr. G. Bouscaren, by letter, said :

I had hoped to reply before this to your invitation to discuss the report of the Finance Committee on the proposed amendment for compounding annual dues by one payment, and regret exceedingly that my occupation at the present time will not allow me to give this subject all the attention that it deserves.

Believing the question to be one of great importance concerning the future welfare of our Association, I trust that the Society will not finally pronounce upon it until both sides have been thoroughly and fairly considered.

The adverse conclusions of the Committee seem to be based chiefly on the supposition that the effect of the proposed measure would be a marked decrease in the financial resources of the Society for the first twenty years following. Admitting the mathematical correctness of the calculation, I would suggest in support of the proposed amendment :

1st. That the assumption made in the calculation, that compounding would be generally followed by members, can hardly be sustained, being contrary to actual practice in other societies where the same privilege exists.

2d. That the compounding money, once paid, would be an assurance against eventual loss of annual dues from death, resignation or incapacity to pay.

3d. The privilege of compounding does not seem to have had a depressing influence on the English and French societies, who are both in very flourishing condition, with comfortable and convenient homes, and large amounts permanently invested, this being attributable principally to their numerous memberships, the amounts of the annual and compounding dues being less in each of them than for the American Society, as shown by the following comparison :

	Annual Due.	Compounding.	
English Society....	{ Resident Members..... 4 guineas.	50 guineas.	
	{ Non-resident Members... 3    "	25    "	
French Society....	All Members.....	25 francs.	600 francs.
American Society..	{ Resident Members..... 25 dollars.	300 dollars.	} Proposed.
	{ Non-resident Members... 15    "	150    "	
MEMBERSHIP (1881).			
English Institution (all paying classes).....			3,957
French       "       "       ".....			1,817
American   "       "       ".....			about 550

I believe that the prosperity of the Society in the future does not depend so much on the amount paid by each member as on the ability of the Society to recruit a large membership, and one of the first conditions to accomplish this is a liberal Constitution, granting the same privileges as are granted in other societies to facilitate the payment of dues.

Col. WILLIAM E. MERRILL, by letter, said :

I had intended making a careful investigation into the matter of commutation of dues, proposed by five members of the Society of which I was one, but, unfortunately, I was suddenly summoned to Washington on business, and was unable to do so. I have thought it best, however, to submit a few remarks that I hope may be found pertinent.

To my mind the pecuniary question resolves itself into this :

What is the present value of \$15 per year paid by members of the American Society of Civil Engineers, or, what is the present value of an annuity of \$15 per year, which will continue as long as the average life of the members of this particular Society ?

The answer to this is purely a question of mathematics, if we can decide upon :

1. A proper rate of interest.
2. An average length of life of members of the Society.

If we can assume, as I think we may, that the length of life of our members will come up to the average of American experience, we will have the following :

AGE.	EXPECTATION OF LIFE.
35	31.8
36	31.1
37	30.4
38	29.6
39	28.9
40	28.2
41	27.5
42	26.7
43	26.0
44	25.3
45	24.5
46	23.8
47	23.1
48	22.4
49	21.6
50	20.9

If, for example, we assume that the average age of our members is 40 years, the probable average duration of the annual payments will be



28.2 years. If we assume 45 as the average age, the average duration of payments will be 24.5 years.

The following is the formula for determining the present value of an annuity which will run a given number of years :

$$a = \frac{b}{r} \left( 1 - \frac{1}{(1+r)^t} \right),$$

in which

$a$  = present value of the annuity.

$b$  = the annual payment.

$t$  = the number of years.

$r$  = the annual interest on one dollar.

(See Davies & Peck, Dictionary of Mathematics, p. 30.)

I have not had time to apply this formula to many cases, but I have worked out the following :

AVERAGE AGE.	RATE OF INTEREST.	
	4 per cent.	6 per cent.
40	250.92	201.66
44	235.98	192.77
45	231.54	190.03

I would therefore suggest that the proper way to settle this matter, on a basis that will be unassailable, will be to ascertain the age of each member of the Society, and after the average age has thus been determined, to obtain the opinion of a reliable actuary, as to the rate of interest that should be charged, and the "Expectation of Life" that should be assumed for members of this particular profession.

When these main points are fairly established, then the Society will be able to judge of the actual cash value of its annual income, and can fix a fair sum for the composition of dues.

I will not dwell on the arguments in favor of compounding—such as the advantage of having a *certain*, even if small, income, enough to keep the Society together if all other sources fail—the importance of saving high interest by paying our building debt—the great mutations incident to the profession of Civil Engineering, which often make it easier to pay a lump sum in flush times than constant annual fees—the example of sister societies abroad, &c., &c.; because I understand that other members will enlarge on these considerations.

In conclusion, I must apologize for the late date of this letter, but I have been unexpectedly hindered.

The report of the Finance Committee on the subject of compounding annual dues by one payment, already issued in circular form and printed in Proceedings, Vol. VII ; October, 1881, p. 102, was read ; the conclusion of that report being as follows :

“ With these facts before us, and in the present state of our finances, when our expenses so nearly correspond with our income, we cannot recommend any basis for compounding dues which shall tend to lessen our present annual income.

The plan of compounding the dues of members on the basis proposed would tend to seriously lessen our annual income. And the more generally this plan came into practice, the greater would be our financial embarrassment.

The only amounts that, under the present circumstances, would be safe to adopt would be so large as to appear unreasonable, and tend to discourage members from compounding.

While we look with favor upon the plan of compounding dues as having for its object the permanent and best interests of the Society, and which, if in successful operation, would in time accomplish all that might be expected of it, yet we fear that its introduction at the present time might so seriously embarrass the Society financially as to jeopardize those important interests which this plan was especially designed to subserve.

We therefore recommend that this proposed amendment to the Constitution be not adopted.”

Respectfully submitted,

W. H. PAINE,  
JOS. P. DAVIS,  
C. V. SMITH,  
*Committee on Finance.*

On motion, it was resolved : That this Annual Meeting recommends to the Society that the above proposed amendment to Article XXII, is injudicious in the present condition of the Society and that it should not be adopted.

The following resolution was offered by Mr. William G. Hamilton, and seconded : That any member of the Society who may have given \$500 to the Building Fund, or who may give \$500 to that fund during the next three years, shall be made a life member from the date of such payment, and shall be exempt from annual dues.

Mr. William P. Shinn made the point of order that to effect the object of this resolution, would require the regular forms provided for an amendment to the Constitution.

The motion was lost.

The following proposed amendment was then discussed :  
 Proposed amendment to Article XXIV.

After the words "Fellowship Fund" at the end of the first line, insert the words, "Ten Thousand Dollars of which shall be," so as to read : "There shall be a fund called the Fellowship Fund, ten thousand dollars of which shall be devoted exclusively to the publication of the papers read before the Society," &c., &c.

Also add at the close of the article, the words, "Fellows shall be elected in the same manner as Honorary Members."

MR. O. CHANUTE.—I may explain, in connection with this proposed amendment, that the Fellowship Fund has been practically dead for six years. There has been during that time but one accession to the Fellows of the Society. That fund was originally pledged to the publication of papers read before the Society. The interest received from it is wholly inadequate to paying any considerable portion of the cost of the publications of the Society, and the necessity of having a fund of that kind has practically passed. The amount of that fund is now about \$9,000, and the annual interest would be \$450. It is not proposed to take any portion of the fund which has accrued for other uses ; but it is proposed to devote future accretions as the members of the Society may think best to determine ; for that purpose we propose to limit the amount specifically pledged to the publications to the sum of \$10,000, or \$1,000 more than has been gathered, and to leave the disposition of future accretions to be hereafter determined ; for that purpose a few verbal changes are proposed in the article.

On motion, it was resolved, that this Annual Meeting recommends to the Society the adoption of the above proposed amendment to Article XXIV.

The following proposed amendment was then discussed :  
 Proposed amendment to Article V. :

Second line by striking out the word "five" and inserting the word "ten," so that it shall read "ten Directors."

The Article will then read : Article V.—The officers of the Society shall consist of a President, two Vice-Presidents, a Secretary, Treasurer, Librarian, and ten Directors, &c., &c.

In response to an inquiry, it was explained that the Society was organized under the Laws of the State of New York, and that those laws required that a majority of the Board of Direction should constitute a quorum.

MR. WILLIAM E. WORTHEN.—This amendment is one of my proposition. From my experience on the Nominating Committee, having been twice Chairman, I have seen the necessity that non-resident members should be represented by more Directors in our Board. Under the present system, out of ten, there can be only four non-residents, which in the ticket just elected consists of President, one Vice-President, and two Directors. As a quorum is essential for the transaction of business, it has involved what seemed to be a necessity to have a majority of the

officers, or six, as residents. Our new President, who was Vice-President last year, and our last President, although non-residents, have attended many of the Directors' meetings, and it seems to me, that by proper selection from non-resident members in our vicinage, we shall be as sure of a quorum as from residents. I would like that, as far as possible, the United States should be represented on the Board of Direction. The amendment was proposed to bring the matter before the Society ; it can be changed or amended as we see fit.

MR. THEODORE COOPER.—Mr. Chairman : Mr. Joseph P. Davis, one of the proposers of the amendment, was called away, and wished me to express his changed opinion in regard to the proposed amendment. The idea is to increase the number of the Board of Direction. The law requires that the quorum shall be a majority of the whole Board. All that have been present at these meetings know the difficulty of getting together a quorum of the Board of Direction. The Secretary has to drum very loudly at times to get a quorum together. It seems to me that the more you increase the number, the more you increase the difficulty. A majority should be resident members, or members within limits such that they can come to the meetings, or they cannot have a quorum. If the Secretary has to drum up fifteen Directors, his duties are going to be largely increased. How it is going to benefit the Society by increasing the number I do not see. We cannot take members from a distance to represent the United States, for if we do we will destroy the possibility of a quorum.

MR. WILLIAM E. WORTHEN.—In that view we had better have one Director. It seems to me it is a National Society, and the nation should be represented. I have been on the Board of Direction, and I understand the difficulties of getting a quorum, but I do not see why people cannot come to the necessary meetings from a little distance as well as people right here. At present, we may say, there are four outside members—the President from New Jersey, the first Vice-President from St. Louis, the first Director from Canada, and the second one from Washington. We distributed it around as well as we could. It does seem to me that if we could put in somebody from Philadelphia, Boston, Springfield and Hartford, it would add a great deal to our Society, and make it more national.

MR. THEODORE COOPER.—I appreciate the fact that the Society should be represented abroad, but how is it to be done ? The gentleman has limited it to a *little* distance from New York. That will not cover the United States. Is it necessary to thus represent the United States ?

MR. WILLIAM E. WORTHEN.—The four that we have got out of the city are about as well distributed as possible, but if there were more Directors the vicinity might be here represented.

Mr. Cooper knows what the trouble is of making up a ticket. It is difficult to suit all meridians.

MR. CHARLES H. FISHER.—It is suggested that you enlarge your Board of Directors ; make twenty-five if necessary and let there be from these an executive committee of four or five appointed, composed of those who reside in the city, and give them full power. Of course, it would require some constitutional amendment. It would nationalize the society so far as having its officers live in all parts of the country, and yet there will be the power concentrated—leaving the rights in the hands of the full committee.

MR. J. J. CROES.—The law requires that the majority of the Trustees should form a quorum for the transaction of business. I do not know whether that majority has a right to delegate their powers to a small minority. I think it highly probable that in some matters the transactions of such a committee could be upset by any persons disposed to make trouble. The difficulty of getting a quorum which equally exists, as to those members who live away and those who live in New York, is very great. As it is, if you increase the number you increase the difficulty. There have been twenty meetings of the Board of Direction, called for various purposes since the last annual meeting. You can see that when a Director lives in Philadelphia, who is in active business, it costs him something in time and in money to attend all the meetings of the Board of Direction. We have had an offer to pay the expenses of a Director from that city, but I fear the gentleman who made it would back out.

MR. WILLIAM E. WORTHEN.—Was there a quorum in all our meetings ?

MR. J. J. R. CROES.—I do not know sir.

MR. WM. P. SHINN.—I believe there is no motion before this meeting.

The CHAIR.—The subject of this amendment is before the meeting.

MR. WILLIAM P. SHINN.—I sympathize with the object which Mr. Worthen desired to attain by his amendment. I am always in favor of doing all we can in any way to nationalize the society, but I doubt the plan simply for the reason that it is difficult to get a quorum together. I thought of making the suggestion that Mr. Fisher made, but I had the same doubt about its legality. For the purpose of bringing the matter to a point, I *move*, that this meeting recommends that the amendment should not be passed or adopted, and that the subject be referred to the incoming Board with the request that they obtain information upon the point as to whether the Board of Direction can be increased and can delegate its power to a committee composed of the minority of the Board ; and in case they find that it can be done, to submit their amendment to the constitution for action at the next meeting.

MR. THEODORE COOPER.—There is a clause in the By-Laws providing for an executive committee ; the action of the executive committee is legal, only after it is endorsed by a quorum of the Board of Directors,

at a future meeting. They are acting without authority until then ; then it becomes perfectly legal. That is the principle, as I understand it, of all executive committees.

The SECRETARY read clause referred to by Mr. Cooper, viz.: By-Laws, Section 18. "The Board of Direction shall provide for an executive committee to act in the absence of a quorum or during the intervals between meetings."

MR. WILLIAM E. WORTHEN.—How many times during the year has there been a quorum of Directors ? How many meetings would be necessary ? It seems to me there is need of but very few. May be more than when I was a Director. We did not have twenty meetings.

The SECRETARY.—One of the most important subjects which the Board of Direction has to consider, is the passing upon applications for membership. There has been a feeling among the members of the Board of Direction for several years past, that that was a duty, and that as many as possible of the Board ought to be present when it was attended to ; outside of that there is a good portion of the business of the Board that could be done by committees ; there are certain points where it would be absolutely necessary to have a quorum of the Board.

MR. WILLIAM E. WORTHEN.—Could not that be submitted to each member of the Board of Direction by letter ?

The SECRETARY.—I tried that, and the members of the Board—not myself—the members of the Board did not like it. They thought that discussion and talk over an applicant's fitness was an important element in passing upon the application.

MR. THEODORE COOPER.—There are many new members of the Board of Direction who come in, like all new members of boards, prepared to reform everything that has been done in the past. Only by attending the meetings, and hearing the discussions, can a Director fully understand the condition of this Society. If you appoint half-a-dozen members, scattered all the way from Canada to Mexico, and who know nothing of the internal action of the Society, it will not tend to improve the condition of the Society, for they have no ready means of entering into the discussion with the other Directors or knowing what has been done in the past. The gentleman, whom I stated before I represented, Mr. Davis, formerly resided in Boston. If I understood him properly at that time, he did not believe as he does now, that the managers in New York are doing the best for the Society that circumstances will permit. During the past year he has been a resident member of the Board of Direction, and understands clearly the difficulties to be met by the Board in their management of our affairs. Now that is the trouble ; we have a number of Directors who have never come to our meetings ; they never know what is going on. I think, if you could get them all to attend, it would be well to have more Directors, but until that can be accomplished, I can see no benefit from increasing their number.



MR. GEO. W. DRESSER.—I think, as to the principle of this amendment, it is not good policy in the management of any corporation to have too large a Board of Directors. There is no great efficiency gained by a large Board, while the difficulty of obtaining a quorum would be greater if you increased the number of Directors. I think and suggest it would be better to keep things just as they are.

A MEMBER.—Pay the Directors five dollars each, every time they come.

MR. J. J. R. CROES.—By the rules of the Institution of Civil Engineers of England, a record is kept of the members of their Board present at each meeting, and it is read at the annual meetings, and those members who have attended the least are ineligible for re-election. The difficulty in the discussion of this matter is, there is too much talk of sectionalism. We are a National Society, and I am sure, that every member of the Board feels that, as much as every member that lives in Kalamazoo or Kamschatka. There is too much talk about that, because the question where a man lives does not make any difference in regard to the Society; it is only a question as to the practical management of the business operations of the Society, and unless those members live reasonably near New York, you cannot get them to attend. Here are four members of the Board that can be scattered around fifty miles; Mr. Worthen has mentioned that they come from Missouri and Canada; those can be shifted around, and still there will be a representation of these gentlemen from the outside; but I know from my recollection of the meetings of the Board of Direction, that we do not hear from those gentlemen, or get any suggestions from them once a year—from those gentlemen who are communicated with at least every month by the Secretary. All papers and circulars are sent to them, and they are requested to say what they have to say; but they do not say it, nor do they come. But as to any feeling because New Yorkers are by the law obliged to attend to the actual business management, I do not think that it is fair to advance that kind of sectional and provincial argument.

MR. M. M. TIDD.—This is the first time I have heard anything of sectionalism. It comes from the New York members now. I have been well satisfied with the manner in which matters have been managed; I have been highly and well satisfied, and no doubt I shall always be.

MR. J. J. R. CROES.—That gentleman has not had the privilege of seeing the correspondence of the Secretary.

A motion was then made that this Annual Meeting recommends to the Society that the above proposed amendment to Article V of the Constitution be not adopted.

The CHAIR.—The motion is seconded. All in favor of the motion, that this amendment be not recommended, will say aye.

The motion was carried.

The CHAIR.—The amendment is not recommended. The other resolution was—will Mr. Shinn please repeat in his own words?

MR. WM. P. SHINN.—I think, after the discussion that has taken place, I will withdraw the motion in regard to requesting the Board to investigate the legality.

The CHAIR.—Then the motion is withdrawn.

The following proposed amendment was then discussed :

Proposed amendment to Article XXXIII. :

Strike out the word "October" in the third line and substitute therefore the word "November."

Also strike out the word "February" in the eighth line and substitute the word "March."

It was explained that these were merely verbal changes made desirable by the change of the date of the Annual Meeting from November to January.

On motion, it was resolved, that this Annual Meeting recommends to the Society the adoption of the above proposed amendments to Article XXXIII.

The Committee on the Gauging of Streams presented the following report :

#### REPORT OF THE COMMITTEE ON THE GAUGING OF STREAMS.

NEW YORK, January 18, 1882.

The Committee on the Gauging of Streams have the honor to present some gaugings of the Connecticut River at Hanover, N. H., made under the direction of Prof. Robert Fletcher, A. S. C. E., during the past summer, giving the details of the operations and the flow of the stream in a very dry season.

The Committee have to repeat what has been reported to the Society before, that the difficulty of creating an interest in the subject of stream gauging among those persons who are in position to have such gaugings made as will be useful, has been most discouraging to them, and they request that the Committee be discontinued.

Respectfully submitted,

J. J. R. CROES,  
*Chairman.*

THEO. G. ELLIS.

On motion, the report was received and the Committee discontinued.

The Secretary announced details of programme for the next day.

The meeting, at 1 P. M., took a recess for lunch, which was served in the Society House.

The session was resumed at 2.30 P. M.

The Board of Direction presented the following report on the subject of Tests of Iron, Steel and other metals :

## REPORT OF THE BOARD OF DIRECTION.

AMERICAN SOCIETY OF CIVIL ENGINEERS, }  
 127 EAST TWENTY-THIRD STREET, }  
 NEW YORK, January 17, 1882. }

The Board of Direction herewith transmits to the Society the report made to it by the Committee appointed at the last Annual Convention "to examine further into the subject of Tests of Iron and Steel, and other Metals," &c., &c.

REPORT OF THE COMMITTEE ON THE SUBJECT OF TESTS OF IRON,  
STEEL AND OTHER METALS.

The Committee of the American Society of Civil Engineers, appointed at the Convention at Montreal, June 17th, 1881, to "examine further into the subject of Tests of Iron, Steel and other Metals, and to report a recommendation to the Board of Direction, who shall take such action as they see fit," beg respectfully to report that they have had a number of meetings and have as a Committee consulted with two members of the late U. S. Board for Testing Iron, Steel and other Metals, and have individually consulted with three members of this Board, also with a number of manufacturers of different metals in different parts of the United States.

Your Committee do not understand it to be within their province to discuss the work of the U. S. Board. The unavoidable delay incurred by it in getting the testing machine at Watertown built, tended to weaken the public belief in the necessity for the existence of such a Board, and no doubt helped to strengthen the opposition made to appropriations for its use.

They find that the Board has done a large amount of valuable work in developing a comprehensive scheme of tests, and in carrying a few of these to completion. For all this it deserves the hearty thanks of scientific men.

Your Committee are of the opinion that it is of the utmost importance that Congress should appoint a Commission to superintend a systematic series of tests of structural materials, and should place in the hands of this Commission such sums by annual appropriation as may be necessary for the successful prosecution of the work; and with instructions to commence at once with a series of tests which will be so practical as to convince the people of the United States of the necessity which exists of having such tests made; while at the same time the Commission should be instructed to carry on the scientific tests which have, so far as the public is concerned, only a theoretical interest.

It is our opinion that these practical tests should be made on structures which the public use, such as beams, bridges—and the various members of which these are composed—columns, wire cables, and other materials used in construction, in which the public has a direct interest.

Your Committee do not consider it of so much importance by whom the work is done, as that it should be done, and that the results should be published, both for the benefit of the public and of the engineering professions, with the least possible delay.

We think that it is desirable to have the work of such a Commission carried on under Government auspices, either by a civil commission alone, or by a civil commission associated with the officers representing the Engineering Corps both of the Army and Navy.

All the chemical and physical experiments made by this Commission should be systematically recorded ; and published as soon as there are enough of them to make it worth while ; without comment at first, so that they may be discussed by all the scientific men of the country, with a view of having a large number of expert opinions previous to publishing the results for the practical use of the professions interested.

Your Committee also think it probable that it is wisest that the U. S. Testing Machine should remain where it is. They think, however, that it should at once be brought up to its maximum of efficiency, and that it should be open to the use of the public, when not actually in the service of the Commission ; and that one of the conditions of its use should be that the parties using it should allow the results to be published by the Commission.

This Committee are also of opinion, that the Commission to be appointed should be composed either of ten civil engineers, or of five civil engineers and five officers of the Staff Department of the Army and Navy ; the civil engineers to be members of the American Society of Civil Engineers, the American Institute of Mining Engineers, or the American Society of Mechanical Engineers,\* and to be appointed by the President of the United States ; that it should be the duty of this Commission to organize itself, and to receive and account for all appropriations made for this work, to employ all necessary assistance for carrying on the work, to arrange plans for work to be done, and for the purchase of the necessary materials ; to arrange in general how tests are to be made, and the forms of reports from assistants to the Commission ; to arrange for a distribution of these preliminary reports to experts, requesting criticisms and suggestions from the persons receiving them ; to make up the final report ; to report to the proper department both as to accounts and work done ; to distribute or direct the distribution of the final report in such manner that copies of the same shall be distributed among engineers and other parties having direct interest in the scientific and practical results ascertained, in preference to the usual methods of distributing the same.

That the *necessary* expenses of members of the Commission shall be paid from the appropriations.

That in case no commission be authorized by Government, a permanent committee be appointed by the Society to institute by any means in their power the carrying out of tests such as are most needed and the spread of information thus gained, through the medium of the Society's publications.

It is the opinion of your Committee that a Committee with power to act in

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\* It has been learned by a comparison of the lists of members of these Societies that most of the members of the Am. Soc. Civ. Engs. who could serve on such a committee are also members of the Am. Inst. Min. Engs. and of the Am. Soc. Mechan. Engs.

the name of this Society should be appointed with the least possible delay ; and that they should ask all the engineering societies, technological schools, learned societies and colleges of the country to co-operate with them in influencing Congress to appoint a Commission who should be entrusted with the whole subject of preparing and making tests of all the materials used for structural and engineering purposes.

All which is respectfully submitted,

THOS. EGLESTON, *Chairman.*

W. METCALF.

A. P. BOLLER.

THOMAS C. CLARKE.

F. COLLINGWOOD.

The great and pressing importance of resuming the investigation begun nine years ago, into the strength of metallic structures, the parts and materials of which they are composed, can hardly be overstated. While, perhaps, it is best realized by members of the engineering profession, every consideration of public safety, of corporate and private economy demands that we should increase our knowledge of modern structural materials.

This can in no way be so well done as by a commission of experts (both civil and military), which shall avail of the Government machine to carry on the necessary experiments, and to generalize from these, and from the results of the many thousands of private experiments of which it can obtain the records, the general laws which should govern in the framing of specifications and the designing of structures.

Success will largely depend upon the character of the commission, and especially upon the engineer who may be selected by it to perform the actual work of carrying on the tests, and of deducing general conclusions from them. In order, therefore, to secure the best results, the necessary legislation will need to be carefully considered, and elaborated in connection with those of our members most competent to give sound advice on this subject.

The Board of Direction, therefore, recommends that it be authorized by the Society to memorialize the Congress of the United States, and to promote, so far as it can be done, without incurring expense, the introduction and framing of a law adequate for the intended purpose.

On motion, the report was received. Mr. Lyman Bridges moved that the report be adopted, which motion was seconded.

The Chair, Mr. Ashbel Welch : Discussion is now in order.

Gen. WILLIAM SOOY SMITH.—I wish to take this opportunity to express my great gratification that the recommendations of the Committee should be so precisely in accordance with what has already been done toward securing the accomplishment of this great work. The report sounds to me like "a twice told tale."

There is scarcely a recommendation it contains which has not been acted upon and carried out by the Committee that preceded this one. The original bill passed by Congress provided for the appointment of a similar Board, except as to the number of its members.

That was a mixed Board, consisting of several civil engineers and of officers of the Army and Navy. The bill went further, and provided that the Board should go on and *make* tests; not that it should *superintend* them. The idea that these tests can be made by certain persons and *superintended* by certain other persons who shall make a report upon them and present it to the country as their work, is, I think, altogether wrong. The work should not be done by proxy; but it should be done by competent men, who, watching the experiments as they are performed, may gather the best lessons they teach. I do not suppose there is an engineer present, who has made experiments, who does not know that the most valuable suggestions they afford, are often developed and caught by the quick eye of an experienced observer while the test is in progress. The mere manual labor, the handling of the samples, and the machinery employed, will, of course, be done by mechanics trained to this work. But the experiments must be watched, the results observed, and deductions made by engineers specially fitted for such duty by natural aptness, thorough education and large experience. All the facts revealed will then be noted, correctly arranged, and conclusions logically drawn from them.

This is the kind of investigation that turns out to the advantage of the world. Such labor should be well paid for, and it is unworthy of a great Government like ours to accept such services for nothing. It is only by years of patient, faithful work, performed by the ablest engineers in this country that the knowledge we so much need can be acquired. And to expect a Board to do it at arm's length, leaving the burden of it to be performed by a single individual, is, I think, to commit a great error, and one fatal to the value of the work and to the confidence it should command. Is there one of us here present who feels competent to undertake this great investigation and to carry it through alone, even though aided by an able Board at a distance?

This Government ought to see that this great work is done, on which the welfare and lives of its people depend in such large measure. And it should pay for it.

It is easier to get the Government to undertake it again, and easier to get the necessary appropriations from Congress to have the work well done and decently paid for, than to inaugurate and carry through a less thorough and reliable set of investigations. The representatives of the Government will say, bring before us a well digested measure, which will secure such thorough accomplishment of the work proposed that the positive knowledge you require will be sure to be obtained, and all doubts removed on vital questions touching the strength and characteris-

tics of iron and steel, and we will vote for it. We desire to feel that when the work is done, it will be well done.

That was the view presented to the Government before.

Some of the gentlemen here present accompanied your former Committee to lay this matter before the Committee on Appropriations of the U. S. House of Representatives. In the beginning we were notified that we would be given fifteen minutes in which to explain the matter. The Representatives soon became so interested that the limitation of time was removed, and the result was a conference lasting nearly half a day, and an appropriation of seventy-five thousand dollars with which to build a testing machine and to begin the tests. Congress was then advised that this would only suffice to begin the work, and that it would be asked for appropriations, from time to time, as means might be required to carry it on.

With the money so appropriated the machine was built. You know of the delays that occurred. These were unavoidable, and thoroughly compensated for by the excellence of the testing machine when completed. It is beyond question the most perfect one ever built, and it could not have been so well done in less time.

The Board labored earnestly. The machine was built, a comprehensive mapping out of the experiments and investigations proposed was made, and the work fairly commenced.

You were advised, from time to time, of the hostile influence that worked to destroy the Board. There was but one apparently, and this was revealed to you from year to year.

At the end of eight years of labor that was performed gratuitously by your former Committee, whose members were willing, nay, glad to contribute this much to the cause of science, and so to the general good, you discharged that Committee, with thanks, to be sure, and appointed this one, as a sort of Investigating Committee, and it has gone over exactly the same ground in the way of inquiry and recommendation.

I do not wish to take exception to its report. I desire harmonious action on the part of this Society, and will contribute all I can to such action.

I am glad the members of this Committee have reached conclusions so precisely in accord with those which governed the action of the Committee that preceded this one. I have profound respect for their views, and those of the Society.

I hope there will be no division of opinion amongst us on this very important subject. We want success and we must be willing to work hard for it; but let us do it rightly, and let us not sacrifice the valuable features of our plans for getting the knowledge we must have through a mistaken notion that Congress will not appropriate enough money to do this in the most perfect way.

Congress will make the necessary appropriations if all the members

of this Society will work to convince its members of the absolute necessity of the knowledge we seek.

The Supervising Architect once informed me that in his department alone, the Government consumed eight thousand tons of iron and steel in fifteen months. Enormous quantities of these materials, and of wood, brick and stone are purchased and used by the Government every year, and yet the rules and formulæ which govern the use of these materials are inaccurate, and in some instances actually misleading, as we all know.

This consideration alone should justify ample appropriations for such tests and experiments as will enable a Board to correct these rules and formulæ, and to place before our profession and the people all the knowledge we require to enable us and them to apply the materials used in construction wisely and economically.

There are two branches to this subject, as there are to most with which the civil engineer has to do, viz., the science of it and the art of it. There are new processes employed in the production of the metals, and many new forms in which they are used—the art progresses rapidly—the science lags behind—and we have not tested sufficiently these new products and shapes. These are constantly multiplying, and it will require industrious testing and experimenting to keep the science up with the art.

Each of us now has to make his own experiments, and the country derives little advantage from them. They are disconnected and desultory, designed generally to ascertain the strength of the parts of our structures, and not to establish any general laws for the government of others in the use of the materials used in construction.

The connected and complete investigation of the strength and qualities of these materials, and the deduction of right rules and formulæ from the results of such investigations is the work of the Government, and it is its imperative duty to perform it.

If we all work vigorously and together we can influence the Government to resume this work and complete it.

But we must not degrade this work by entrusting it to a *Superintending* Board, which is to let it out to be done by a single man, however able he may be.

One man can make a certain set of experiments best, another can best pursue another line of investigation, each working in the field of his own experience and strongest talent.

The Ordnance Department can make its experiments for the determination of those qualities which it requires in the metals for its uses. The Engineering Department will make other tests to gain the knowledge it requires. The Navy seeks still other knowledge, and the civil engineers, manufacturers and mechanics of the country, coming from the broad field of its civil industries, ardently desire such knowledge as



will enable them to make and use iron, steel and other materials wisely and well, under the varied requirements which they have to meet and satisfy. Let these all be represented in a Government Board which shall devote its whole time and best energies to the great work now under our consideration, and then and only then will it be well and thoroughly done.

Neither Faraday, nor Humphrey Davy, Newton nor Laplace, trusted their investigations to second hands, but made them themselves; and so all truly great and valuable searches for scientific truth are made.

I beg the indulgence of the Society for the earnestness with which I have endeavored to impart this view of the work of the testing Board, it is the result of years of thought on this subject, and I feel sure that it is correct. I have all respect for the opinions of the gentlemen who framed the report. I have simply felt it my duty to take issue with them on that point and one other.

The report recommends that the Board shall report to "the proper department."

We know now how that will end. The Board will be required to make the experiments under the direction of, and make its report to the Ordnance Department of the United States Army. This was attempted before. A letter of instruction came to us to that effect, and we had to go to Washington and get the letter recalled. It is not right that any department should exercise such control. It is not what is due to the officers of other branches of the Government service. It is not courteous to the civilian members of the Board. It is not consistent with the proper performance of the work, and it is not and never was graceful in any department of the Government to seek such authority over a Board created to be independent. No department of the United States Government has the necessary knowledge and skill to do this work, and none should be permitted to control it to its sad detriment. Why should we go to a department to get this great work done, requiring the widest range of engineering talent, skill and experience? We do not seek their aid when we design and build bridges, tunnels and railroads. The Board should be independent, and it should report directly to the President or to Congress, and not to any department. And in whatever may be done, it will be necessary to guard carefully against any instructions precedent which any department may propose to give.

I beg pardon once more for the manner in which I have presented these views, and reaffirm my great gratification with the report of the Committee as a whole.

I hope its recommendations may be carried out, with the exception of the two which I have endeavored to criticise, and these, I think, the Society will do well to have changed.

Mr. F. COLLINGWOOD—I do not wish to reply at length to what Gen. Smith has said, because I agree with him entirely. The only point I

wish to refer to is this : the Committee, I think, would have been very glad to have recommended exactly what he suggests as to a paid commission. They discussed that matter at considerable length, and I am sorry to say, they had a feeling that it would endanger the appointment of a commission. If it is thought by a larger number that a paid commission can be carried through, then I think the Committee would heartily recommend it.

Then, as to the other point, reporting to the proper department as to the work done, it was simply expected that if money was entrusted to the Committee to expend, it should report to the proper department what they had accomplished. I scarcely think that it can be made to mean that we were to go to the department for instructions.

Mr. W. SOOY SMITH.—I wish to state again that I feel that I have good reasons to believe that there is no difficulty insurmountable in getting the necessary appropriations from the Government to make these experiments. The cause of our failure to get further appropriations before, I think, was stated to this Society. It was a lack of interest on the part of the members of our Society—and yet not all, because some did work hard. It was a lack of general interest, a lack of active interest. With a membership of over 600, scattered all over this country, we can reach every member of both Senate and House. It is a thing that is so manifestly right and necessary that there is no difficulty whatever in showing that the thing is right, and if we will take the trouble to speak to each member, it can be accomplished. Men will be paid by the Government, and they should be.

The compensation should be equal to that of any Government officer on the Board. There were only three civilians on the old Board. The clause providing pay for the civilian members was cut out, and I think for the purpose of driving them out of the Board. We should not make that mistake again ; let us ask the Government to do this thing as it ought to be, and I think it can be more easily accomplished in that way than in any other. No one engineer can do that work as it ought to be done. I do not think any one present would feel competent to go over all the field, but that competency we can get by proper selections from the great body of engineers in the country ; and in that way, it seems to me, it ought to be done.

Capt. O. E. MICHAELIS.—I only want to say a few words not only as a member of the Society, but also as a Government officer. There is one thing that should be remembered : Congress does not make appropriations and leave their disbursement to what it would consider irresponsible officers. They are disbursed under the Treasury Department or the War Department or some other department, and Congress holds the heads of those departments responsible for the expenditure of the money. Of course, special appropriations being made, and the heads of departments not being experts, they must confide the work to their

proper subordinates ; and while I listened with much interest to my gallant friend and cordially agree with him, still I take exception in one point. There is Government supervision in almost everything. Now, we have here in this Society probably the best bridge builders in the country. They know, however, that they cannot build a bridge over a navigable stream without submitting their plans to officers of the Government. The plans must be approved by those officers, and after that the bridge may be built. Such a course does not seem to be inconsistent with the respective rights and dignity of all concerned, and I feel certain that with proper provision as to expenditures, the officers of the Army and Navy would accept any programme proposed. Of course, I, as an ordnance officer, would prefer that my department had that supervision. Still, there must be that supervision. The President, however, is primarily responsible. He transfers it to the Cabinet officers, and they to some one subordinate to themselves. Some one man is held responsible for certain money. That is the principle that runs throughout our Government.

**MR. LYMAN BRIDGES.**—The Ordnance Department has certainly made many tests for their special requirements. There are, however, in the Engineer Corps of the Army many able officers, and if this work is to be referred to any other department, it seems to me it should be to the Engineer Bureau of the Army.

**MR. THEODORE COOPER.**—Before the discussion goes any further in this direction, permit me to say, that as Civil Engineers we have no objection to any department of the Government doing any portion of this work which properly lies within their field of experience. But the whole field of investigation is too wide to be put in charge of any department, whose proper duties are confined within comparatively narrow limits. Our aim is not solely to know the strength of iron, steel or bronze, for the making of ordnance, but for the innumerable applications of these metals for constructive purposes in the arts and sciences. A field we claim to be almost exclusively in the hands of our civilian engineers, constructors and manufacturers, and which is but slightly within the experience of any single department of the Government. We desire this work put into the hands of men whose past experience is such as to enable them to start from the plane of our present knowledge, and as to lead them to a full and comprehensive examination of this subject. To use our time and money to the best advantage, we think, such men, acknowledged as our present experts in the past knowledge of these metals are the proper ones to direct the advance upon the strongholds of our ignorance in regard to their full properties.

**MR. WILLIAM METCALF.**—I would like to say a few words on points that seem to me vital. In regard to the departments, I agree entirely with the gentleman from the Ordnance Department. It is simply absurd for this or any society of irresponsible people to ask the Government

to make appropriations of large sums of money that we shall not account for. It is no matter to us what department we report through, but unless Congressmen can feel that they will get reports through officers that are responsible, we need not hope for any appropriations at all. The second point is in regard to the question of supervision by the Department. It was the intention of the Committee to provide that this body of experts should direct and control the character of the work to be done, and lay it out fully for the employees of the Commission; and they also provided that this Commission should have charge of the direction of the publication of these reports. Thus the preliminary reports to submit to the Society and to all experts, and the final reports would be so distributed that they would go where they could do the most good. I would like to know how the gentleman expects this Society to retain an interest in a work year after year, except they get reports. There is a great deal of difficulty in getting the first reports, though there were enough published to have gone into the hands of every member. They are lying in the bar-rooms and grog shops, and engineers cannot get them. Further, what is everybody's business is nobody's business. If it is left to five or six hundred members of the Society, that work will never be carried on; but if there is a commission properly organized, of the right kind of men, then this Society and all other scientific bodies throughout the country will see that it has their moral and active support; everybody will aid in carrying on their work, and there will be little difficulty in getting the necessary appropriation. As to the third point in carrying out this work, I doubt if you can select from this Society, to make these experiments, any commission which would do as well as one man—a man who is a thoroughly educated engineer, and who, after six months' practice on that machine, could do everything that this Commission should require him to do, having nothing to see to except the doing of the actual work. Some man must do that, and he must be an expert. In my experience, I have never yet seen an engineer in Pittsburg interfere in any way. Inspection is about the first work that an engineer is set to do. I know in my own case, when I first started in business, I was put in charge of the testing of gun iron, under Major Wade and Major Rodman, and in a few months the whole matter was put in my hands. I spent months in Watertown, and neither General Rodman nor Major Wade ever thought of coming near the machine. They depended upon me, and took the figures and reports and used them; and that is exactly what any commission will have to do if they want to get good, thorough work. They will have to employ competent clerks, and then you must select the very best and ablest men to superintend and lay out and plan. Then you can get the work well done, and I do not believe you can get it done satisfactorily in any other way. These are the considerations which led us to develop those three points in the report, not in any sense criticising the old Commission, and

only hoping to secure the entire confidence of the Government, so that there would be no difficulty, from year to year, in obtaining all necessary appropriations. In regard to the officers of the army, I never, so far as I had any experience with them or knowledge of them, saw an officer who was not always ready to do all he could to aid such work, and ever glad to get all the results he could, and who would not turn in and do all he could to help on with the work, and especially if he were an expert in his business.

Mr. Wm. SOOY SMITH.—I approve fully the suggestion of the expenditures being under the supervision of the Governmental departments. There never was any objection made. Upon that point I presume we are all agreed. I also agree fully with the last Committee as to the method of making reports. I think it is a very wise idea and a good one.

As to the third point, I return to the original ground. I do not think any single man should be entrusted with the direct supervision of the work. I think we have proven the worthlessness of the knowledge obtained in that way upon which we have relied heretofore. We are told that competent engineers would not attend to these experiments, and that novices, when they commence work, are put in charge of these experiments. We know that is true. We don't want that done in this case. We want an expert in each line of investigation. I do not think that there is or can be any doubt on this question in the minds of those who have given the subject earnest consideration. If these experts are paid as they should be, they can devote their whole time to it, and we will have the work thoroughly done. I know the investigations are made in the old world in this way. In Berlin I saw Spangenberg in his shirt-sleeves in his great workshop, and he was not trusting to assistants to make the experiments in which he is specially interested. It is in that way that the best lessons can be learned.

On the other two points I thoroughly agree with the Committee's recommendations.

Another consideration I wish to present, and that is the impropriety of requiring a Board not only of civil engineers, but made up of officers in different branches and corps of the Government service, to be under direction of a single Government department. It is not proper that the Board should be subject to such direction, and in the old Board general objection to that was made. No more harmonious Board could be organized than the old one was. There were honest differences of opinion, such as exist everywhere amongst thinking men, but they were amicable.

We should urge that this Board should be independent, and that no Government department should prescribe the tests to be made nor the manner of making them.

The following resolution was offered by Gen. Wm. Sooy Smith :

*Resolved*, That the report be received, and that the Board of Direction

be authorized to memorialize Congress, and to promote, so far as it can be done without incurring expense, the introduction and framing of a law adequate to resume the investigation into the strength of structures, and the parts and materials of which they are composed.

This resolution was seconded, and accepted by Mr. Bridges as a substitute for that offered by him.

The resolution was then adopted.

MR. WILLIAM METCALF.—Before proceeding to other business, I would like to say, in behalf of the American Institute of Mining Engineers, that that Institute will meet in Washington on February 21st, 1882, and the following days. That Institute has arranged to give to this subject one whole session of its meetings, and has provided for a discussion by members especially qualified to speak thereon. If the Board of Direction of this Society can have the memorial to Congress prepared before that time, I am sure the members of the Institute of Mining Engineers will make every effort to promote a proper disposition of the matter.

The following resolution was offered by Mr. O. Chanute ; seconded and adopted :

*Whereas*, Mr. T. F. Rowland has subscribed \$2,500 to the Building Fund, and this subscription, much the largest thus far made by any one member, should be specially acknowledged by this Society ; therefore,

*Resolved*, That the thanks of the American Society of Civil Engineers be tendered to Mr. Rowland for his generous subscription, and that he be presented with a copy of these resolutions.

*Resolved*, That the Board of Direction be instructed to make the necessary arrangements to institute an annual prize, of the value of at least \$50, to be known as the "Rowland Prize," and to be regularly awarded hereafter, to the authors of papers read before the Society, under rules to be jointly framed by Mr. Rowland and the Board of Direction.

A member who was not present at the morning session requested information as to the action taken in reference to compounding annual dues or creating Life Memberships. This information being given, a motion was made and carried reconsidering the action taken at the morning session in reference to the proposed amendment to Article XXII of the Constitution, so as to allow further discussion.

MR. LYMAN BRIDGES.—In reading a report recently issued from the Finance Committee, I was surprised to find that they did not see that compounding dues or creating Life Memberships would inure to the benefit of this Society. It seems to me they ought to have reported a proper sum for this purpose. Other similar societies have Life Memberships, and certainly a sum can be found which will be fair and advan-

tageous to all. If \$300 is not enough, then some other sum must be enough. Interest certainly accumulates, and if five per cent. cannot be depended upon, then take a lower rate. It does seem to me a mistake to have the action of this Annual Meeting go out as discountenancing the idea of Life Memberships. I would like to become a Life Member at whatever price may be determined upon by the Finance Committee as fair, and I am inclined to move that it be the sense of this meeting that an amount of \$500, or such an amount not exceeding \$500 as the Finance Committee deem fair, should be the sum at which annual dues may be compounded by one payment.

The Secretary, Mr. JOHN BOGART.—I am afraid that the report to which the gentleman alludes, was so long that he did not quite read through the whole of it. The report was made under these circumstances: An amendment to the Constitution was regularly offered, fixing the future rate for compounding annual dues at a definite stated amount. Neither the Board of Direction nor the Finance Committee had any right to alter that amount, or to in any way change the proposed amendment. But, as the Board considered the subject of the greatest importance, it requested the Finance Committee to look into it, in its bearings upon the finances of the Society. The Finance Committee did so, and prepared a report, which the Board issued simply for the information of the members of the Society. That report showed that, in the judgment of the Committee, the affairs of the Society were in such a condition that it would be unwise to recommend a basis for compounding dues which would tend seriously to lessen the present annual income; that the amounts which, under present circumstances, it would be safe to adopt would appear large, and the Committee feared might tend to discourage members from compounding. The Committee added: "While we look with favor upon the plan of compounding dues as having for its object the permanent and best interests of this Society, and which, if in successful operation, would in time accomplish all that might be expected of it, yet we fear that its introduction at the present time might so seriously embarrass the Society financially as to jeopardize those important interests which this plan was especially designed to subserve."

The Committee, as the gentleman states, did not fix a rate for compounding dues. It really was not their duty to do so, because only the Society, at the Annual Meeting, has the right to change or amend a regularly proposed amendment to the Constitution. This, I think, explains the point made as to the report referred to. I may add, that I feel sure, in view of the discussion of to-day and of the consideration that will certainly now be given to the subject, that a plan will soon be elaborated which will successfully accomplish the desired result, and which will give a method of compounding dues alike just to the individual member and to the Society at large. With this expectation, I suppose that it will be the better course to recommend that the present proposed

amendment be not passed. For myself, I will say that the subject impresses me as so important that I will endeavor to aid, as far as I can, in its suitable and speedy solution.

NOTE.—By an error in transcribing, the statement of the funds and income of the English Institution of Civil Engineers was incorrectly given in the Proceedings of this Society, October, 1881, Vol. VII., p. 108.

The statement for December 1, 1881, is :

Institution Investments.....	£36 838
Trust Funds .....	14 642
Total.....	£51 480
Or, say.....	\$257 400

The total receipts for the year were :

Strict income, including dues, interest on Institution Investments, etc.....	£12 398
Other receipts, including admission fees, and life compositions, which are treated as capital, also interest on Trust Funds .....	3 508
Total.....	£15 906
Or, say.....	\$79 530

Mr. LYMAN BRIDGES.—Not having been present this morning, I have, with several other members, asked for this information. In response to the circulars requesting contributions to our Building Fund, I have desired to do something, but I also desired to pay for a Life Membership, and had hoped the two might be combined. It seem that it ought to be possible to do so, or, at all events, to fix a sum, the payment of which would relieve any member so desiring of future annual dues.

Mr. Charles H. Fisher, moved to amend the proposed amendment to the Constitution by striking out \$300, and inserting \$500; and striking out \$150, and inserting \$300; and said that if invested at 5 per cent. these amounts would give to the Society the same annual income as the present dues.

Mr. JOSEPH P. DAVIS.—I doubt whether we should adopt this motion. If we find afterward that we can afford lower rates, it would be a mistake to recommend these. I think it is better that we should pass the motion we have reconsidered.

Mr. WM. P. SHINN.—The last article of the Constitution of the Society, which provides that proposed amendments shall be in order for discussion and amendment at the Annual Meeting, and with such amendments thereto as may have been approved by a majority vote of the Annual



Meeting, shall be voted upon by letter ballot, has been construed by the Board of Direction to provide that both the original proposition and also the proposition as amended at the Annual Meeting should be sent to letter ballot. I do not agree with that construction of the article, but it has been so decided. The result, in the present case, might be such a division of the vote as would prevent either proposition from being adopted. But since the non-resident members are not now very largely present, they might not understand how decidedly this Annual Meeting feels that the proposition, in its original form, should not at present be adopted. Should both the original amendment and this proposed modification of it go to ballot, many members might not be as likely to recognize the fact that the discussions here have determined in the minds of those present that the original amendment is not in a shape to be now adopted with advantage to the Society, and they might, therefore, vote for it, and the Society thus be bound to a provision not now desirable.

If we simply recommend that the original proposed amendment be not adopted, it will probably be more effective, and the subject can be taken up and put into proper shape at some future meeting.

In reference to subscriptions to the Building Fund, it must be remembered that amounts paid for compounding dues will not go to the Building Fund at all, but to the General Fund of the Society, the interest from which is used to defray current expenses. We have already discussed the propriety of passing a resolution to the effect that a subscription of a certain amount to the Building Fund should constitute the subscriber a Life Member. But we have decided that we could not do this, and the proposition that this meeting should recommend such action was not agreed to, because members present thought it inexpedient as tending to effect a change in the fundamental law of the Society, without previous general notice to members.

Under all the circumstances, it seems to me that the action of this morning, in recommending that the proposed amendment be not adopted, is the most desirable.

MR. LYMAN BRIDGES.—Can not this meeting recommend that one proposition, when submitted to letter ballot, should be passed, and the other not passed? If this is done, I think it probable that the recommendation will be considered by members when they vote.

MR. CHARLES H. FISHER.—I did not understand, when I offered this amendment changing the sums from \$300 to \$500, and from \$150 to \$300, that both the original proposition and its amended form, as perfected at this meeting, would go to letter ballot. If that is the case, I am inclined to withdraw my amendment.

MR. WILLIAM P. SHINN.—At the last Annual Meeting a precisely similar case occurred. There was an amendment offered as to the manner of electing members. The Annual Meeting amended that proposed

amendment. The ballot was sent out by the Board of Direction, providing for a vote on both the original and the amended proposition. The result in that case was a division of the vote, and neither proposition was adopted. The danger in the present case is, as I have said, that, if it seems to be a question between two propositions, members who do not look thoroughly into the subject may vote for the one which in the view of this meeting is undesirable, while if the single original proposition is sent out, with the positive recommendation of this meeting that it be not adopted, then it will, probably, not be adopted.

Mr. LYMAN BRIDGES.—It seems a pity that we can not recommend to the Society, with a probability of the recommendation being followed, some scheme which will secure the result which everybody here thinks desirable. I hope the way will be found to do it now. If not, I hope that at the earliest possible time after this meeting such a scheme may be elaborated. I have none now to propose. I venture to suggest that perhaps this division of residents and non-residents should not be taken into account in a compounding plan, but that one proper sum may be adopted for all members. Again, the laws in relation to annuities and life insurance premiums have been so well studied that their application to our case ought not be very difficult. Again, it might be arranged that the payment of the amount of dues for a term of years—say, perhaps, twenty years—should constitute Life Membership. At all events, it is certainly important to do something, and I believe such measures as have been suggested will help increase both the Building and the General Fund.

Mr. JOHN BOGART.—While an addition to the General Fund does not increase the Building Fund, yet the interest from the investment of the General Fund would go directly towards paying the interest on the mortgage now held upon our property; so that the result of a contribution to either fund would be substantially the same.

The amendment proposed by Mr. Charles H. Fisher was then lost. The original motion was then again voted upon, and carried, as follows:

That this Annual Meeting recommends to the Society that the above proposed amendment to Article XXII of the Constitution is injudicious in the present condition of the Society, and that it should not be adopted.

Mr. WILLIAM P. SHINN.—The tone of the discussion at this meeting has clearly shown that the feeling is in favor of such action as would admit of a subscription by a member to the Building Fund effecting a final payment of annual dues and constituting a Life Membership, and I have no doubt that as soon as it can be legally done such action will be proposed, and it will probably be adopted.

Mr. F. Collingwood exhibited specimens of wires which had been tested, and explained the results of the tests.

After an announcement of the programme for the following day, the Annual Meeting adjourned.

The Members of the Society present at the Annual Meeting, were :

Julius W. Adams, T. H. Aldrich, Wm. M. Allaire, E. R. Andrews, W. H. Atwood, O. W. Barnes, George S. Baxter, Van Brunt Bergen, H. Bissell, H. D. Blunden, James P. Bogart, John Bogart, A. P. Boller, E. W. Bowditch, H. R. Bradbury, W. H. Bradley, Lyman Bridges, Chas. O. Brown, Thomas E. Brown, Jr., L. L. Buck, W. D. Bullock, James A. Burden, Wm. H. Burr, O. Chanute, E. S. Chesbrough, H. Wadsworth Clarke, Thomas C. Clarke, Thomas M. Cleemann, F. Collingwood, A. G. Compton, Theodore Cooper, Martin Coryell, J. James R. Croes, Charles G. Darrach, Jos. P. Davis, E. A. Doane, E. B. Dorsey, George W. Dresser, Thomas Egleston, N. W. Ellis, S. Clarence Ellis, Theo. G. Ellis, Theo. N. Ely, Charles E. Emery, Charles A. Ferry, Albert Fink, Charles H. Fisher, Clark Fisher, Sandford Fleming, M. N. Forney, Chas. E. Fowler, George H. Frost, E. E. Glaskin, Charles E. Goad, Bryant Godwin, Wm. H. Grant, S. M. Gray, D. M. Greene, George S. Greene, Jr., A. R. Haddock, S. S. Haight, Wm. G. Hamilton, Geo. E. Harding, Henrique Harris, B. D. Hasell, C. H. Haswell, W. A. Haven, A. B. Hill, Wm. R. Hutton, Walter Katté, Charles Kellogg, E. D. Leavitt, Jr., G. Leverich, Charles Macdonald, Arthur Macy, C. C. Martin, C. S. Maurice, James McCrea, T. H. McKenzie, George W. McNulty, Wm. Metcalf, O. E. Michaelis, H. S. Munroe, George S. Morison, Henry G. Morse, Isaac Newton, James Owen, Charles Paine, Wm. H. Paine, F. C. Prindle, Chas. Ward Raymond, David Reeves, J. Gardner Sanderson, Wm. H. Searles, Wm. P. Shinn, S. H. Shreve, W. W. C. Sites, C. Vandervoort Smith, Wm. Sooy Smith, R. P. Staats, Cook Talcott, Joseph R. Thomas, R. H. Thurston, M. M. Tidd, Robert Van Buren, E. B. Van Winkle, C. C. Waite, Henry F. Walling, C. D. Ward, L. B. Ward, Ashbel Welch, Thomas J. Whitman, F. M. Wilder, W. H. Wiley, John A. Wilson, Jos. M. Wilson, W. W. Wilson, S. Wimmer, De Volson Wood, and William E. Worthen.

The Members of the Society on Thursday morning met as arranged in the programme given below, which was carried out in all details.

## AMERICAN SOCIETY OF CIVIL ENGINEERS.

ANNUAL MEETING OF 1882.

JOHN BOGART,                      GEORGE W. DRESSER,  
 WILLIAM H. PAINE,              C. VANDERVOORT SMITH,  
 CHARLES E. EMERY,

*Committee.*

## PROGRAMME.

WEDNESDAY, JANUARY 18, 1882.

The Annual Meeting will be held at the House of the Society, beginning at 10 A. M.

The Annual Reports will be presented ; officers of the Society elected; proposed amendments to the Constitution discussed. Reports are expected from the Standing Committees on Gauging of Streams, on Tests of Cements, and on preservation of Timber; also a report from the Board of Direction on the subject of Tests of American Iron, Steel and other metals. These reports will be discussed. General business will be transacted.

*Lunch* will be served at the House of the Society at 1 P. M. After lunch the session of the meeting will be resumed at 2:30 P. M. An evening session will also be held if found desirable.

THURSDAY, JANUARY 19, 1882.

Meet at Works of Manhattan Gas Company, cor. 18th Street and 10th Ave., at 10 A. M. (Members who prefer can meet at the Society House, at 9:30, and proceed thence to the Manhattan Works). Opportunity will be given for inspecting the whole of the works, if desired, and especially the practical working of the Ross Steam Stoking Machinery, together with arrangements for the economical handling of coal.

Thence proceed by boat to the Works of the Hudson River Tunnel, at Hoboken. The plans and practical operations connected with the Tunnel will be exhibited and explained.

Thence by boat, to the Station of the Pennsylvania Railroad at Jersey City, where its terminal arrangements will be examined.

Thence, also by boat, to the Brooklyn Pier of the New York and Brooklyn Bridge. The bridge will be crossed upon the main floor, which will be planked. This will be the first party to cross upon the main roadway.

From the New York terminus of the Bridge, proceed to the foot of Courtlandt Street, and visit the works of the New York Steam Heating Company, near the corner of Courtlandt and Greenwich Streets.

Thence, by boat, to the foot of 23d Street, North River, to inspect the work in progress at that point by the Department of Docks.

In the evening a Reception will be held at the House of the Society at 8 P. M., after which Supper will be served in the Library.

### APPROXIMATE TIME TABLE.

#### JANUARY 18TH.

##### AT SOCIETY HOUSE.

10 A. M., Business Meeting.	2:30 P. M., Adjourned Meeting.
1 P. M., Lunch.	8 P. M., Evening Session (if held).

#### JANUARY 19TH.

10 A. M., Manhattan Gas Works.	1 P. M. Arrive Brooklyn Bridge.
10:45 " Leave " " "	2 " Leave " "
11 " Arrive Hudson River Tunnel.	2:30 " Arrive Courtlandt St.
11:45 " Leave " " "	3:15 " Leave " "
12 M., Arrive Pennsylvania R. R. Station.	3:45 " Arrive Foot West 23d Street.
12:30 P. M. Leave " " "	8:00 " Reception at Society House.

Much gratification was expressed with the arrangements, and with the fact that the Lunch on the day of the meeting, and the Reception and Supper on the evening of the second day, were held at the New House of the Society, which afforded accommodations for the enjoyment of a remarkably pleasant evening.

# American Society of Civil Engineers.

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## PROCEEDINGS.

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Vol. VIII.—February and March, 1882.

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### MINUTES OF MEETINGS

(Abstract of such as may be of general interest to members.)

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#### OF THE SOCIETY.

FEBRUARY 1ST, 1882.—The Society met at 8 P. M., Mr. Charles Macdonald in the Chair. Ballots were canvassed and the following candidates declared elected as members: Enrique Budge, Valparaiso, Chili; Chester B. Davis, Omaha, Nebraska; Robert Gordon, Henzada, British Burmah; George S. Rice, Charleston, Arizona; Thomas J. Seely, Las Vegas, New Mexico; Romeo Paul Tomassek, New York.

The deaths of the following named members were announced: Theodore Ransom Scowden, of Cleveland, Ohio, elected Member May 7, 1873, died December 31st, 1881; Moses Lane, of Milwaukee, Wisconsin, elected Member, December 4th, 1867, died January 25th, 1882; Alexander Lyman Holly, of Brooklyn, New York, Past Vice-President, elected Member, October 1st 1873, died January 29th, 1882,

FEBRUARY 15TH, 1882.—The Society met at 8 P. M., President Welch in the Chair. A paper by R. E. McMath, Member A. S. C. E., subject: "The Mean Velocity of Streams Flowing in Natural Channels," was read by Secretary Bogart, and discussed by Messrs. T. C. Clarke, Collingwood, Joseph P. Davis, Emery and Welch.

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### REPORT OF THE BOARD OF DIRECTION

*For the Fourteen Months ending December 31st, 1881.*

Presented and accepted at the Annual Meeting, January 18th, 1882.

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The Board of Direction in presenting this Report for the fourteen months ending December 31st, 1881, desires to congratulate the Society upon this first annual meeting in a house of which it is itself the owner.

The purchase of this property is in the opinion of the Board a most important step in the progress of the Society. The great necessity of better provision for the accommodation of the different departments of Society work has been felt by many of our members for a number of years. The advance of the rent of the house in Twentieth Street, occupied since May, 1877, rendered it necessary either to rent new quarters, or to purchase a suitable house. The circular inviting subscriptions to a fund for the purchase of a house was issued January 1st, 1881. Details of the progress of the subscription, and of the purchase of this house are given in the following portion of this report. Before doing this the Board desires, in behalf of the Society, to acknowledge the promptness and liberality which has characterized the action of those who have subscribed to this fund. The number of paid subscriptions, up to January 1st, 1881, is 110; the amount paid to that date is \$14,012. Among the subscriptions are three of \$200, two of \$250, three of \$500, and one of \$2,500. The spirit which prompted this last-mentioned subscription from an engineer who has been a member of the Society many years is thoroughly appreciated by the Board, and doubtless also by all the members of the Society.

Of the 110 subscriptions 77 have been made by Members or Fellows of the Society, and 33 by non-members. Of the 77 subscriptions made by members, 22 have been from resident, and 55 from non-resident members. Of the 33 subscriptions made by non-members, 4 have been from residents of New York and its vicinity, and 29 from persons residing beyond the bounds defining resident membership.

The annual charge to the Society for interest on the mortgage upon the premises, and for taxes, is now about the same amount as has been paid for the rental of the premises occupied for a number of years. This annual payment can of course be substantially reduced by an increase of the Building Fund, and thereby a reduction of the mortgage interest. When this shall be accomplished the revenue of the Society can be appropriated more fully to its general uses, and the publications can be substantially enlarged. The Board therefore renews in this report the appeal heretofore made by circular letters, and earnestly impresses upon the members of the Society, the great and important desirability of an increase of this fund. There are now 657 persons who are members of one or another class in the Society, 580 of whom have not subscribed to this fund. Of course there are a number among these who may not feel willing or able to do this, but there are also a large number whose lack of action is believed to be the result of inattention to the subject. Could the fund be largely increased within a short time by the action of these members, it is the emphatic opinion of the Board that the result would be of paramount advantage to the Society.

The property which is now owned by it is valuable, and is worth more now than when purchased by the Society.

By an amendment to the Constitution, adopted in February last, the termination of the Society year has been changed from the first Wednesday in November to the thirty-first day of December of each year. This report, therefore, covers the period of fourteen months, from November 3d, 1880, to December 31st, 1881.

On November 3d, 1880, the membership in the Society was:

Honorary members, resident....	3	Non-resident....	9	Total...	12
Corresponding members.....		"	3	"	3
Members, resident.....	114	"	359	"	473
Associates, " .....	6	"	14	"	20
Juniors, " .....	6	"	42	"	48
				—	541
Making, resident.....	129	Non-resident....	427		—
Total.....					556

Fellows 66 of whom, 10 members, and 1 honorary member are included above, leaving..... 55

Total connected with the Society, November 3, 1880.....611

At the present time the membership is :

Honorary members, resident, 3	Non-resident....	8	Total....	11
Corresponding members...	"	3	"	3
Members resident.....	119	"	394	513
Associates, " .....	9	"	15	24
Juniors, " .....	8	"	46	54
				— 591
Making, resident.....	139	Non-resident....	466	—
Total.....				605

Fellows, 63 of whom 10 members and 1 honorary member are included above, leaving..... 52

Total connected with the Society January 1, 1882..... 657

The additions during the past year to the several classes of Society membership have been :

Members qualified.....	45
Former members restored.....	2
Associates qualified.....	4
Juniors qualified.....	11
	—
Total additions to the several classes of membership.....	62



The decrease during the year in the several classes of membership has been :

Honorary members	Died, 1	1
Members	Died, 5.. Resigned.. 2	7
Juniors	Died, 0.. Resigned.. 2 Transferred to member 3	5
Fellows	Died, 3	3
<hr/>		
Totals	Deaths, 9 Resignations. 4 Transfers	3 16

There has thus been an addition of 62 to the various classes of membership, and a loss by deaths, resignations and transfers of 16, making the actual net additions during the year 46 in number.

On November, 3, 1880, there were, as stated in the last Annual Report, 40 proposals pending ; 76 proposals have been received during the year ; 48 candidates have been elected Members, of whom 3 were transferred from Juniors, 4 candidates have been elected Associates ; 11 candidates have been elected Juniors.

45 persons have, during the year, qualified as Members ; 4 have qualified as Associates ; 11 have qualified as Juniors ; 3 candidates elected during the year as Members have not yet qualified ; there are 15 proposals now pending.

Twenty-six meetings of the Society were held during the year, one of which was the Thirteenth Annual Convention, all the sessions of the Convention, including the business meeting, being counted as one meeting of the Society. Meetings have been held on the first and third Wednesdays of each month, except that there were no meetings in August, and but one in July.

Twenty meetings of the Board of Direction have been held during the year.

One of the meetings of the Society was held at Chickering Hall, in March, 1881, when Lt. Commander Gorringer, U. S. N., presented an illustrated paper upon the removal of the Obelisk from its site in Alexandria, Egypt, to its present site in the Central Park, New York City. This interesting paper was the first public presentation by Commander Gorringer of the engineering features connected with his successful undertaking.

The Annual Convention of the past year was held at Montreal, Canada, June 15, 18, 1881, and was attended by one hundred of our members. In addition to the time spent at that city, visits to Niagara Falls, to Toronto, to Ottawa and to Quebec, were included in the arrangements, and at each of those points, as well as at Montreal, opportunities were afforded for the examination of matters of special interest to engineers.

The constant increase of interest in the Conventions has been largely augmented by this, the first one held beyond the limits of the United States. The Board of Direction desires to record its acknowledgment of the obligation of the Society to its members in Canada, and to those who assisted them in perfecting the admirable arrangements made on that occasion.

The Board desires also to call the attention of all members of the Society who have not attended its recent Conventions to the fact, that opportunities for the discussion of professional subjects, for the examination of public works, and for the extension of social acquaintance among engineers, are afforded in a remarkable manner at these Conventions. Their influence has been excellent in many directions, and they have been greatly enjoyed by all who have taken part in them.

It is hoped that the attendance upon them will be largely increased, and that special effort will be made by all our members to be present at them in the future.

The Library has been increased during the year by the following additions :

Number of books bound.....	97
“ “ “ unbound.....	118
“ “ pamphlets.....	654
“ “ maps and plans.....	27
“ “ photographs.....	16
“ “ drawings, specifications, models and specimens.....	93

These do not include magazines and papers contributed to the Society by publishers, or received in Exchange for the Transactions, a list of which is given in an appendix to this report.

The present state of the Library is about as follows :

Books and pamphlets.....	9,607
Manuscripts.....	116
Maps, plans, drawings, charts, photographs and engravings.....	2,157
Models and specimens.....	258

The catalogue of and index to the Railroad Section of the Library has been published and issued during the past year. This index has been not only an aid to the examination of books in the Library, but also an indication of much that has been published in this branch of engineering, and thus has been useful in itself as a book of reference.

The Secretary has, under the direction of the Board, issued recently the following circular.

AMERICAN SOCIETY OF CIVIL ENGINEERS, }  
127 East 23d Street, New York. }

Dear Sir,—You will confer a favor by sorting over the pamphlets in your possession, and sending to the Society such of them, relating to Engineering topics, as you are willing to contribute.

We already have a large collection of railroad, city, canal, waterworks and other reports, which form one of the most valuable features of the Library, and we desire to make it more complete by preserving as full a history as possible of the progress of our public works.

We also desire copies of testimony taken in patent cases; controversies concerning bridges, railroad crossings, reports of committees of investigation and of legislative commissions, &c., &c.

We also desire a copy of all new reports issued by your company.

All contributions will be duly acknowledged in the Transactions of the Society.

By order of the Board of Direction,

JOHN BOGART, *Secretary.*

The Board desires to impress upon the Members of the Society the great value of any contributions to the Library.

During the year demands for Engineers to take charge of various works, have far exceeded the number of members of this Society recorded with the Secretary as open to new engagements. Members who are in want of employment, or who contemplate changing their connection, are urged to send a record of their names, qualifications and expectations to the Secretary.

The Norman medal is thus far the only prize which the Society can annually offer for excellence in the papers presented at its meetings. It is desirable that a larger number of prizes shall be at the disposal of the Society, as an incentive to have papers carefully prepared, and to draw them out in adequate numbers. It is, therefore, suggested that members who can afford it, or who know persons of means, interested in particular subjects, shall promote the establishment of funds for the annual awarding of additional prizes, under such conditions as the donors shall specify and the Board of Direction accept.

Reports made during the year have been as follows :

By the Board of Direction : The Annual Report for the year.

By the Finance Committee : 2 Reports.

By the Treasurer : His Annual Report and frequent statements to the Board.

By the Secretary : Monthly Reports to the Board.

By the Committee on Tests of American Iron, Steel and other Metals : 1 Report.

By the Committee on Gauging of Streams : 2 Reports.

By the Committee on Uniform System of Tests of Cement : 1 Report.

By the Committee on Preservation of Timber : 1 Report.

The Treasurer's Report and the Report of the Finance Committee will be submitted at this meeting.

By the Committee on Engagement of Civil Engineers upon Government Works : 1 Report, and the Committee discharged.

By the Nominating Committee : 1 Report.

By the Committee on Award of Norman Medal : 1 Report.

Reports will be expected at this meeting from the Board of Direction on Tests of American Iron, Steel and other Metals ; from the Committees on Gauging of Streams ; on a Uniform System of Tests of Cement ; on the Preservation of Timber ; on Uniform Standard Time, and on the Award of Norman Medal.

The Transactions and Proceedings have been regularly issued during the past year. The Board reiterates the appeal to Members of the Society, so often heretofore made in the Annual Reports and elsewhere, to contribute to these Transactions papers or memoranda from the rich field of engineering experience now enlarging rapidly. It is only by the active and constant assistance of the members of the Society that the efforts of the Management and the Editor of the Transactions can result in a proper presentation of this essential element in the Society work.

The proposed Amendments to the Constitution, which have been presented since the last Annual Meeting, have been printed and distributed to members, and will be submitted for discussion at this meeting.

The Society has lost by death, during the term covered by this report, one Honorary Member, Baron Max Maria Von Weber; five members, Messrs. Henry Cartwright, G. Thomas Hall, James H. Reno, W. Milnor Roberts and Henry R. Worthington, and three Fellows, Messrs. A. D. Briggs, Wm. G. Fargo and Andrew Kloman. Appropriate memoirs of these deceased members have been, or will be, published in the Proceedings. The Board, however, desires to especially express in this Report its sense of the great loss the Society and the profession have sustained in the death of Col. W. Milnor Roberts, Past President A. S. C. E. Col. Roberts became a member of the Society September 21, 1870. He was elected Vice-President in November, 1873, and continued either as Director or Vice-President till November, 1878, when he was elected President of the Society, which office he held when he left this country to engage in professional service in Brazil. He was also the Treasurer and an active member of the Centennial Commission of the Society. In the exercise of the trusts and duties confided to him in these positions he was always earnest and faithful, and devoted for many years a large share of his thought and action to the welfare of the Society. He was one of the most constant attendants at the meetings of the Board and the Committees, and his associates take this occasion to record their recognition of the value of these services.

Respectfully submitted.

JOHN BOGART,  
*Secretary.*

## REPORT OF THE TREASURER

FOR FOURTEEN MONTHS ENDING DECEMBER 31ST, 1881.

NOTE.—[The change in the date for the termination of the Society year makes it necessary to include fourteen months in the present statement.]

*Presented at the Annual Meeting January 18th, 1882.*

### RECEIPTS.

Balance on hand November 3d, 1880.....	\$3,168 39	
Entrance fees.....	1,600 00	
Current Dues— <i>For the 12 months ending November 3, 1880:</i>		
From 76 Resident Members.....	\$1,789 75	
“ 260 Non-resident Members..	3,703 72	
“ 5 Resident Associates.....	60 00	
“ 10 Non-resident Associates..	95 00	
“ 6 Resident Juniors.....	90 00	
“ 30 Non-resident Juniors....	285 00	
		6,023 47
“ “ <i>For November and December, 1881:</i>		
From 63 Resident Members.....	\$262 10	
“ 206 Non-resident Members..	515 00	
“ 3 Resident Associates.....	7 50	
“ 6 Non-resident Associates..	9 96	
“ 5 Resident Juniors.....	12 50	
“ 26 Non-resident Juniors....	43 15	
		850 21
Past Dues—From 10 Resident Members.....		
“ 21 Non-resident Members.....	\$260 00	
“ 1 Resident Junior.....	425 95	
“ 2 Non-resident Juniors.....	15 00	
	20 00	
		720 95
Dues for year beginning January 1st, 1882:		
From 33 Resident Members.....	\$825 00	
“ 122 Non-resident Members .....	1,785 15	
“ 2 Resident Associates.....	30 00	
“ 3 Non-resident Associates.....	30 00	
“ 2 Resident Juniors.....	30 00	
“ 14 Non-resident Juniors.....	140 00	
		2,840 15

Sales of Publications.....	\$787 48
Certificates of Membership.....	93 00
Advertisements.....	180 00
Miscellaneous.....	64 23
Interest on Fellowship Fund Bonds.....	\$523 95
" Savings Bank Deposit.....	38 92
" Norman Medal Fund Bonds.....	105 00
" Railroad Stock.....	82 80
	<hr/> 750 67
Proceeds of Sale of Fellowship Fund Bonds.....	8,880 00
Advance Subscription for Payment on Building.....	5,000 00
Subscriptions to Building Fund.....	13,987 00
	<hr/> <hr/> \$44,945 55

## DISBURSEMENTS.

Rent to May 1, 1881.....	\$800 00
Interest on Mortgage.....	579 86
Taxes.....	576 40
Publications.....	3,602 60
Stationery and Printing.....	771 35
Postage.....	915 74
Library, including Index to Railroad Section.....	1,036 48
Salaries.....	3,500 00
Convention, Annual Meeting and Special Meeting.....	443 77
Janitor, House Supplies, Fuel, Furniture, Water and Gas...	1,404 22
Certificates of Membership.....	85 20
Other expenditures.....	202 17
Insurance.....	62 59
Norman Medal.....	65 80
Moving to present House.....	284 63
Payment for U. S. Bonds for Fellowship Fund.....	9,129 37
Repayment of advance Subscription for payment on Building.	5,000 00
Payments on account new Society House.....	10,931 38
Transferred to Savings Bank Deposit.....	38 92
Balance on hand, Building Fund.....	3,055 62
Balance on hand, General Fund.....	2,459 45
	<hr/> <hr/> \$44,945 55

The Funds of the Society are as follows :

**Fellowship Fund :**

80 Subscriptions.....	\$8,150 00
Accumulated Interest, November 3, 1880.....	813 83
Interest received, November 3, 1880, to December 31, 1881.....	562 87
Premium received on sale of Jersey City Water Loan Bonds.....	880 00

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\$10,406 70

**Expended from fund, Nov. 3, 1880, to Dec. 31, 1881:**

For Premium on purchase of United States bonds.....	\$129 37
For Publications.....	274 58
	<hr/>
	403 95

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\$10,002 75

**The present investment of the Fellowship Fund**

is, at par value :

9 United States Government Bonds.....	9,000 00
Deposit in Seamens Bank for Savings.....	1,002 75
	<hr/>
	\$10,002 75

**Norman Medal Fund ;**

1 Certificate Croton Aqueduct Stock, New York City....	1,000 00
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**General Investment :**

10 Shares New York Central and Hudson River R. R. Stock.....	\$1,000 00
1 Consolidated Certificate New York Central and Hudson River R. R. Stock.....	35 00
	<hr/>
	1,035 00

**Building Fund:**

Receipts Nov. 3, 1880, to Dec. 31, 1881.....	\$13,987 00
Previous to Nov. 3, 1881.....	25 00

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\$14,012 00

**Expended :**

For Legal Services, Circulars, etc..	\$355 03
For Betterments on Property.....	601 35
Payments on Purchase.....	10,000 00
	<hr/>
	10,956 38

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On hand December 31, 1881..... \$3,055 62

J. JAMES R. CROES,  
*Treasurer.*

## REPORT OF THE COMMITTEE ON FINANCE.

PRESENTED, READ AND ACCEPTED AT THE ANNUAL MEETING, JANUARY  
18, 1882.

*To the Board of Direction of the American Society of Civil Engineers :*

The Committee on Finance have carefully examined the assets of the Society, and find them correctly reported by the Treasurer.

They would further report that they have audited all of the bills that have been paid during the past year, and find them to have been approved and endorsed by the proper officers, and in no case have the appropriations made by the Board been exceeded.

SOCIETY ROOMS, Jan'y 17, 1882.

W. H. PAINE,  
C. V. SMITH,  
JOS. P. DAVIS,

*Committee on Finance.*

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## CONTRIBUTIONS TO THE BUILDING FUND.

By a resolution of the Board of Direction, all contributions to the Building Fund are to be acknowledged, from time to time, by printing lists of the same in the monthly Proceedings of the Society, and in addition to this the names of all those who may subscribe \$100 or more are to be regularly enrolled and published in future lists of the Society under the head of Subscribers to the Building Fund, and they will be entitled to receive one copy of the monthly publications, comprising all papers and transactions of the Society, regularly, for life, for each \$100 subscribed by them ; such copies to be in addition to those which they may be already entitled to if they are Members or Fellows :

The following contributions are acknowledged in addition to those heretofore noted :

A. P. Boller .....	\$150 00
Boston Gas Light Company.....	250 00
John H. Drake.....	150 00
William R. Eckart.....	100 00
N. W. Ellis.....	25 00
C. L. Gates.....	20 00
Mrs. W. H. Greenwood.....	15 00
*S. S. Haight.....	10 00

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\*Additional subscription to payment previously acknowledged.



Sandford Horton.....	\$100 00
John B. Jervis.....	100 00
E. C. Lewis.....	100 00
William Thaw.....	100 00

## LIST OF PUBLICATIONS AND PAPERS RECEIVED FOR LIBRARY.

### APPENDIX TO ANNUAL REPORT OF BOARD OF DIRECTION, JANUARY 18, 1882.

The following papers are contributed to the Society, or are received in exchange for Transactions :

American Architect and Building News.....	Weekly.....	Boston.
American Engineer.....	".....	Chicago.
American Gas Light Journal.....	Semi-Monthly..	New York.
American Machinist.....	Weekly.....	"
Annales des Travaux Publics.....	Monthly.....	Paris.
Army and Navy Journal.....	Weekly.....	New York.
Builder.....	".....	London.
Building and Engineering News.....	".....	"
Bulletin American Iron and Steel Association.....	Semi-Monthly..	Philadelphia.
Bulletin du Canal Interocéanique.....	".....	Paris.
Commissioner of Patents' Journal.....	Semi-Weekly ..	London.
Critic.....	".....	Monthly..New York.
Deutsche Bauzeitung.....	Weekly.....	Berlin.
Engineer.....	".....	London.
Engineering (2 copies).....	".....	"
Engineering and Mining Journal.....	".....	New York.
Engineering News.....	".....	"
Genie Civil.....	".....	Paris.
Iron.....	".....	London.
Iron Age.....	".....	New York.
Journal of Artillery and Military Engineering.....	Monthly.....	Vienna.
" of Society of Arts.....	Weekly.....	London.
" of Gas Lighting.....	".....	"
Manufacturer and Builder.....	Monthly.....	New York.
Manufacturer and Iron World.....	Weekly.....	Pittsburgh.
Mechanics.....	".....	New York.
National Car Builder.....	Monthly.....	"
Record of Scientific Literature.....	".....	"
Railroad Gazette.....	Weekly.....	"
Railway Age.....	".....	Chicago.
Railway Review.....	".....	"
Railway World.....	".....	Philadelphia.
Reportorium der Technischen Literatur.....	".....	Leipsig.
Revue Générale des Chemins de fer.....	Monthly.....	Paris.
Sanitary Engineer.....	Weekly.....	New York.
Scientific American.....	".....	"
Scientific American Supplement.....	".....	"
Tehnic Tidskrift.....	Monthly.....	Stockholm.
Techniker.....	Semi-Monthly..	New York.

Telegraph Journal and Electric Review.....	Semi-Monthly..	London.
The Locomotive.....	Monthly.....	Hartford,
Van Nostrand's Magazine.....	".....	New York.
Zeitschrift fur Baukunde.....	Quarterly.....	Munich.
Zeitschrift fur Bauwesens.....	".....	Berlin.

The following are subscribed for :

American Bookseller.....	Semi-Monthly..	New York.
American Catalogue.....	" " " "	"
American Library Journal.....	Monthly.....	"
Index.....	".....	"
Bookseller.....	".....	London.
Publishers' Weekly.....	Weekly.....	New York.
U. S. Official Postal Guide.....	Monthly.....	Boston.

The Society has received during the year, in exchange for the "Transactions," official publications of the following associations, in many instances for preceding years :

Aeronautical Society of Great Britain.....	London.
Academy of Sciences.....	Washington.
Akademie des Bauwesens.....	Berlin.
American Chemical Society.....	New York.
American Gas Light Association.....	"
American Institute of Architects.....	"
American Institute of Mining Engineers.....	Easton.
American Iron and Steel Association.....	Philadelphia.
American Society of Mechanical Engineers.....	New York.
Annales de Construcciones Civiles y de Minas.....	Lima.
Annales des Ponts et Chaussées.....	Paris.
Argentine Scientific Society.....	Buenos Ayres.
Association of Civil Engineers.....	Lisbon.
Austrian Society of Engineers and Architects (Two Publications).....	Vienna.
Boston Public Library.....	Boston.
Boston Society of Civil Engineers.....	"
Civil Engineers' Club of Cleveland.....	Cleveland.
Die Administration der "Mittheilungen".....	Vienna.
Engineers' Club of Philadelphia.....	Philadelphia.
Engineers' Club of St. Louis.....	St. Louis.
Engineer Department, U. S. A.....	Washington.
Engineers' Society, Western Pennsylvania.....	Pittsburgh.
Essayons' Club, Corps of Engineers, U. S. A.....	Willetts Point.
Franklin Institute Journal.....	Philadelphia.
Imperial School.....	Moscow.
Imperial Technic Society of Russia.....	St. Petersburg.
Imperial University.....	Tokio.
Institution of Civil Engineers.....	London.
" " of Ireland.....	Dublin.
" " of Engineers and Shipbuilders of Scotland.....	Glasgow.
" " of Mechanical Engineers.....	London.
Iron and Steel Institute.....	"
Massachusetts Institute of Technology.....	Boston.
McGill University, Department of Science.....	Montreal.
Mechanics' Institute.....	San Francisco.
Midland Institute Mining, Civil and Mechanical Engineers.....	Barnsley, Eng.
Mining Institute of Scotland.....	Hamilton.

National Board of Health.....	Washington.
New York Meteorological Observatory.....	New York.
North of England Institute of Mining and Mechanical Engineers.....	Newcastle-on-Tyne.
Pi Eta Scientific Society.....	Troy.
Royal United Service Institution.....	London.
School of Mines, Columbia College.....	New York.
Smithsonian Institution.....	Washington.
Society of Arts.....	London.
Society of Civil Engineers.....	Paris.
Society of Engineers.....	London.
Society of Engineers and Architects of Hungary.....	Budapest.
“ “ “ of Saxony.....	Dresden.
“ “ “ “.....	Hanover.
Stevens Institute of Technology.....	Hoboken.
Swedish Society of Engineers.....	Stockholm.
Thayer Scientific School, Dartmouth College.....	Hanover.
Thomasson Civil Engineering College, Indian Engineering.....	Roorkee.
United States Coast Survey.....	Washington.
“ Light House Board.....	“
“ Naval Institute.....	Annapolis.
“ Naval Observatory.....	Washington.
“ Ordnance Department.....	“
University of Michigan.....	Ann Arbor.
Western Society of Engineers.....	Chicago.

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## LIST OF MEMBERS.

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### ADDITIONS.

#### MEMBERS.

	Date of Election.
ANDREWS, JOHN W.....Supt. Midland North Carolina Ry., Goldsboro, N. C.....	Mar. 1, 1882.
BATES, ONWARD.....Bridge Entrance, St. Louis, Mo.....	Jan. 4, 1882.
BONNYN, WM. WINGFIELD. 26 Hospital St., Montreal, Canada.....	“ “
BURNET, GEORGE, JR.....Asst. Engineer I. B. & W. R. W. Extension, Indianapolis, Ind.....	Mar. 1, 1882.
DAVIS, CHESTER B.....Chief Engineer Water Works, Omaha, Neb.....	Feb. 1, 1882.
FELTON, SAMUEL M., JR.. Gen. Man. New York & New England R. R., Boston, Mass.....	Jan. 4, 1882.
GREENE, CHARLES E.....University of Michigan, Ann Arbor, Mich.....	“ “
JAYCOX, THOMAS W.....City Engineer, P. O. Box 189, Lead- ville, Colo.....	“ “
LESAGE, LOUIS.....Superintendent Water Works, Mon- treal, Canada.....	Sept. 7, 1881.
LIGHT, ALEXANDER L.....Chief Engineer, Quebec, Montreal, Ottawa, & Occidental R. R., Quebec, Canada.....	“ “

PRIOR, CHARLES H. .... Supt. Iowa & Minnesota Div. C. M. &  
 St. P. Ry., Minneapolis, Minn., .... Mar. 1, 1882.  
 RICE, GEORGE S. .... Charlestown, Ariz. .... Feb. 1, 1882.  
 SAVAGE, ALBERT C. .... City Engineer, El Paso, Texas. .... May 4, 1881.  
 SEELY, THOMAS J. .... Div. Sup't Atchison, Topeka & Santa  
 Fé R. R., Las Vegas, N. M. .... Feb. 1, 1882.  
 SMITH, CHARLES C. .... Chief Engineer St. Paul, Minneapolis  
 & Manitoba R. R., St. Paul, Minn. July 10, 1872.

## ASSOCIATE.

FROST, GEORGE H. .... Engineering News, Tribune Building,  
 New York City, N. Y. .... Jan. 4, 1882.  
 WATSON, WILLIAM. .... 107 Marlborough St., Boston, Mass. .... Mar. 1, 1882.

## JUNIOR.

BOGART, JAMES P. .... Engineer Conn. Shell Fish Commission,  
 New Haven, Conn. .... Jan. 4, 1882.  
 HAVILAND, ARTHUR. .... Asst. Engineer Tehuantepec R. R.,  
 Jaltipan, Mexico. .... " "

## CHANGES AND CORRECTIONS.

## MEMBERS.

BLACKWELL, CHARLES. .... Supt. Motive Power Norfolk and Western Railway,  
 Roanoke, Va.  
 BRIGGS, R. E. .... Ingeneiro Ferro-caril Central, San Luis Potosi,  
 Mexico.  
 BRODHEAD, CALVIN E. .... White Haven, Pa.  
 BROUGH, REDMOND J. .... City Engineer, Toronto, Canada.  
 CHITTENDEN, S. H. .... Supt. Ivanhoe Mining Co., Grafton, N. M.  
 CROWELL, J. FOSTER. .... Asst. Eng. P. R. R., East Liberty, Pittsburgh, Pa.  
 CUNNINGHAM, D. W. .... Engineer Water Board, Room No. 1, City Hall, Min-  
 neapolis, Minn.  
 DAVIS, CHARLES E. L. B. .... Capt. Corps of Engineers, U. S. A., Engineer 10th  
 Light House District, Buffalo, N. Y.  
 EARLEY, JOHN E. .... Locating Eng. N. M. & A. R. R., Tucson, Arizona.  
 FLAD, HENRY. .... City Hall, St. Louis, Mo.  
 HIDER, ARTHUR. .... Asst, U. S. Engineer, Duncansby P. O., Miss.  
 HOWARD, FREDERICK B. .... 57 Lafayette Ave., Detroit, Mich.  
 JAMES, SAMUEL L. .... 32 Carondelet St. (Lock Box 437), New Orleans, La.  
 KIMBERLY, M. C. .... Div. Supt. Denver & Rio Grande Ry., South Pueblo,  
 Colo.

**BULLOCK, WM. D.**.....City Engineers' office, Providence, R. I.  
**EMONTS, WM. A. G.**.....3909 Pine St., Philadelphia, Pa.  
**WHITLOCK, FRANK W.**....P. O. Box 343, Waterbury, Conn.

LARKIN, EDWARD.....December 31, 1881.

HOLLEY, ALEXANDER LYMAN,  
(Past Vice-President) Elected Member October 1, 1873. Died January 29,  
1882.

LANE, MOSES.....Elected Member December 4, 1867. Died January  
25, 1882.

SCOWDEN, THEODORE RANSOM,  
Elected Member May 7, 1873. Died December 31,  
1881.

WRIGHT, WILLIAM WIERMAN,  
Elected Member November 4, 1872. Died March 9,  
1882.

# American Society of Civil Engineers.

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## PROCEEDINGS.

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Vol. VIII.—April, 1882.

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### MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

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#### OF THE SOCIETY.

MARCH 1ST, 1882.—The Society met at 8 P. M. Mr. T. C. Clarke in the chair.

Ballots for proposed amendments to the Constitution were canvassed with the following results: Upon the following proposed amendment to Article XXII:

Add at end of the article, as follows:

Any member or associate, whose subscription is not in arrears, may compound for future annual subscriptions by the payment of three hundred dollars if he is a resident, and of one hundred and fifty dollars if he is a non-resident. But should a non-resident become a resident he shall pay the remainder of the composition, viz., one hundred and fifty dollars, or the usual annual subscription during the time of his residence.

There were 118 ballots cast; 28 in the affirmative, 86 in the negative and 4 not voting. This proposed amendment to Article XXII not having received an affirmative vote of two-thirds of all the ballots cast, was declared not adopted.

Upon the following proposed amendments to Article XXIV:

After the words "Fellowship Fund," at the end of the first line, insert the words "Ten Thousand dollars of which shall be," so as to read: "There shall be a fund called the Fellowship Fund, ten thousand dollars of which shall be devoted exclusively to the publication of the papers read before the Society," etc., etc.

Also add to the close of the article the words, "Fellows shall be elected in the same manner as Honorary Members."

There were 118 ballots cast ; 98 in the affirmative, 5 in the negative and 15 not voting. These proposed amendments to Article XXIV having received an affirmative vote of two-thirds of all the ballots cast, were declared adopted.

Upon the following proposed amendment to Article V :

Second line by striking out the word "five," and inserting the word "ten," so that it shall read "ten directors."

There were 118 ballots cast ; 18 in the affirmative, 86 in the negative and 14 not voting. This proposed amendment to Article V not having received an affirmative vote of two-thirds of all the ballots cast, was declared not adopted.

Upon the following proposed amendment to Article XXXIII :

Strike out the word "October" in the third line and substitute therefor the word "November."

Also strike out the word "February" in the eighth line and substitute the word "March."

There were 118 ballots cast ; 96 in the affirmative, 1 in the negative and 21 not voting. This proposed amendment to Article XXXIII having received an affirmative vote of two-thirds of all the ballots cast, was declared adopted.

Ballots for membership were canvassed and the following candidates declared elected as members : John William Andrews, Goldsboro, North Carolina ; George Burnet, Jr., Indianapolis, Indiana ; William Henry Martin, San Francisco, California ; Charles H. Prior, Minneapolis, Minnesota ; James Lingam Randolph, Baltimore, Maryland.

The Secretary presented from the Board of Direction a copy of the bill which had been presented to Congress on the subject of Tests of Structural Materials, with a report of the visit of the President and of Members of the Board and of the Society to Washington, and also of the discussion on the subject at the meeting in Washington of the American Institute of Mining Engineers.

Mr. Charles Macdonald offered the following resolutions, which were seconded by Mr. T. C. Clarke and adopted :

*Resolved.* That in the death of Alexander Lyman Holley, formerly Vice-President of the American Society of Civil Engineers, the engineering profession at large, no less than our own Society, has suffered a grievous loss.

In him were combined not only the inventive genius to discover and successfully apply new methods of subduing the forces of nature for the

benefit of mankind (as evinced in the great industries which have been developed under his direction); but a rare literary facility for arranging and distributing stores of information obtained through patient study of the works of others.

By the example of his life, in his gentleness, his modesty, his deferential consideration of opposing counsels, combined with integrity, indomitable energy and power of work, the standard of our profession has been materially advanced, and a spirit of good fellowship engendered which has had the effect to weld in harmonious continuity of interest the several branches of a profession destined to play an increasingly important part in the advancement of civilization.

*Resolved*, That a Committee of Five be appointed to act in conjunction with similar committees which have been or may be appointed by the American Institute of Mining Engineers and the American Society of Mechanical Engineers, in any further measures that may be deemed advisable in honor of the memory of our departed fellow member.

*Resolved*, That we offer to the family of the deceased the assurance of our earnest and respectful sympathy in their affliction.

*Resolved*, That the Secretary be instructed to transmit copies of the above resolutions to the family, to the Secretary of the American Institute of Mining Engineers, and to the Secretary of the American Society of Mechanical Engineers.

The President has appointed the following named members of the Society as the Committee provided for in the above resolution: Messrs. Charles Macdonald, T. C. Clarke, O. Chanute, Isaac Newton and William G. Hamilton.

The Secretary presented a copy of resolutions, of similar purport, upon the decease of Alexander Lyman Holley, which had been adopted by the American Institute of Mining Engineers.

A paper by W. S. Auchincloss, Member, A. S. C. E., upon the Averaging Machine, was read by the author, practically illustrated upon the machine and discussed by Messrs. T. C. Clarke, Joseph P. Davis, Dresser, George S. Greene, Jr., Katté, Morison, and Prindle.

MARCH 15TH, 1882.—The Society met at 8 p. m. President Welch in the chair. The death of William W. Wright, Member A. S. C. E., of Philadelphia, Pa., elected member November 4th, 1872, died March 9th, 1882, was announced.

A paper by E. H. Keating, C. E., City Engineer of Halifax, Nova Scotia, on the Removal of Incrustations in Water Mains, was read by the Secretary and discussed by Messrs. J. C. Campbell, Joseph P. Davis, George S. Greene, Jr., Haswell and Welch.

Remarks upon the subject of the Overflow of the Mississippi River were made by Mr. Lyman Bridges, Member A. S. C. E., and the subject discussed.

APRIL 5TH, 1882.—The Society met at 8 p. m., President Welch in the



chair. Ballots were canvassed and the following candidates declared elected : as Members—William Herbert Bixby, Lieut. Corps of Engineers, U. S. A. ; Frank Augustus Calkins, New York ; Joseph Moss Knap, New York ; Charles Penrose Perkins (transferred), Williamsport, Pa. ; Benjamin Rhodes, Niagara Falls, N. Y. ; Robert Surtees, Ottawa, Canada ; as Associate—John Lockwood, New York.

Ballots for a proposed Amendment to the By-Laws were canvassed, as follows : Proposed Amendment to Section 24, Third Clause and Fifth Clause, strike out the word *October* and substitute the word *November*. There were 76 votes in the affirmative and 2 votes in the negative.

This proposed amendment to Section 24 of the By-Laws, having received an affirmative vote of two-thirds of all the ballots cast, was declared adopted.

On motion, the Board of Direction was requested to submit to the Society a plan for life membership embodying with it a plan for commutation of dues by one payment.

A paper by Alfred P. Boller, Member A. S. C. E., on the "Mode of Underpinning adopted for the Croton Lake Bridge, New York City and Northern Railroad, during the repairs to the Masonry Piers," was read by the Secretary and discussed by members present.

The paper by L. Bridges, M. A. S. C. E., on the Overflow of the Mississippi River, read at the last meeting, was further discussed.

## OF THE BOARD OF DIRECTION.

JANUARY 4, 1882.—Applications were considered. Mr. O. Chanute was added to the Committee on Preservation of Timber, and requested to serve as chairman. Action was taken as to arrears of dues. The subject of Tests of Iron and Steel was referred to a Sub-Committee for consideration. Arrangements were made for the approaching Annual Meeting, and Messrs. Bogart, Dresser, Emery, William H. Paine and C. V. Smith, were appointed a Committee of Arrangements for that meeting. Appropriations were made.

JANUARY 16, 1882.—A report was received from the Committee appointed at the Montreal Convention on Tests of Iron, Steel and other Metals. The subject was discussed. Vice-Presidents Chanute and Welch were appointed a Committee to present the subject to the Society at the Annual Meeting. The Annual Report prepared by Secretary Bogart, was read, amended and adopted. The following resolution was adopted :

*Resolved*, That the Secretary be directed to send to each journal which receives the Transactions of this Society in exchange, a notice that the Publications of the Society are copyrighted, and that the condition of exchange is that in republishing any of the papers or plates published

in the Transactions, they shall be credited to the Transactions of the Society.

JANUARY 25, 1882.—The Board elected at the Annual Meeting, January 18, 1882, met, and under the provisions of the Constitution, the following Standing Committees were appointed :

ON FINANCE :

WILLIAM H. PAINE,  
JOSEPH P. DAVIS,  
GEORGE S. GREENE, JR.

ON LIBRARY :

J. JAMES R. CROES,  
THOMAS C. KEEFER,  
GEORGE W. DRESSER.

The subject of the date for the next Convention, referred by the Society to the Board, was referred to a Committee for consideration and report.

A Committee was appointed to confer with Mr. T. F. Rowland on the institution of the Rowland Prize, as determined by the Society at the Annual Meeting.

A Committee was appointed to draft a memorial, and to recommend suitable action upon the subject of Testing Structural Material.

Appropriations were made.

FEBRUARY 1, 1882.—Applications were considered. Upon report of the Committee the date for the Annual Convention, at Washington, was fixed as May 16, 1882. The Committee on the Rowland Prize reported results of an interview with Mr. T. F. Rowland, and a letter from him on the subject. The Committee was continued. The issue of a circular suggested by the Committee on Standard Time, was considered. A memorial on the subject of Tests of Iron and Steel was discussed.

FEBRUARY, 15, 1882.—A memorial on the subject of Tests of Structural Materials, and the draft of a law on that subject, were adopted. A Committee was requested to visit Washington to promote the investigation of the strength and properties of structural materials. Applications were considered.

MARCH 8, 1882.—Applications were considered. The Secretary submitted a transcript from the books showing the number of members in arrears for dues, with the amount of arrears. It was resolved that the action directed by the Constitution be taken, and that the form of notice prescribed by it be sent to all members in arrears for more than the current dues. At the request of the President the Board considered the question of calling a convention on the subject of Standard Time, and the opinion of the Board was declared that the most suitable time for such

convention would be after receipt of replies to a circular issued by the committee on that subject, and further report by that committee.

The President reported result of the visit of himself and the Secretary to Washington, on the subject of a continuance of tests upon Structural Materials; the meeting with other members of the Society; the presentation of a law and memorial to the Chairman of the Committee on Manufactures of the House of Representatives. The Secretary was authorized to issue a note to members on the subject.

The Secretary announced the gift from the Institution of Civil Engineers, of the Minutes of the Proceedings of that Institution, Volumes I to XX, inclusive, with Vol. 3, of the quarto early set, thus making complete the set of those publications belonging to this Society. The thanks of the Board were ordered presented to the Institution of Civil Engineers.

Appropriations were made.

MARCH 29TH, 1882.—Applications were considered. Arrangements made for the Annual Convention. The purchase of the professional library of the late James P. Kirkwood, Past President A. S. C. E., was authorized. The draft of a letter to Members on the subject of tests of structural materials, was presented by the Secretary and its issue directed.

APRIL 5TH, 1882.—Applications were considered. Action was taken as to Arrears of Dues. Financial business was transacted and appropriations were made.

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#### ADDITIONS TO

### LIBRARY AND MUSEUM.

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From Wm. P. Shinn, New York:  
 Annual Report of the Secretary of Internal Affairs of the Commonwealth of Pennsylvania. Volumes IV, V, VI and VII.  
 Report of the Commissioners of Agriculture. Washington. 1863.  
 Report of the Secretary of War, being part of the Message and Documents communicated to the Two Houses of Congress at the beginning of the First Session of the 44th Congress. Vol. II. Parts I and II. Washington. 1875.  
 Annual Report of the Bureau of Statistics of Labor of the Commonwealth of Pennsylvania. 1872-3. Harrisburg. 1874. (3 copies.)

Annual Report of the Ohio State Board of Agriculture. Columbus. 1871.  
 Annual Statement of the Trade and Commerce of Chicago to the Board of Trade. Chicago. 1869.  
 Annual Report of the Chief of the Bureau of Statistics on Commerce and Navigation. Washington. 1877.  
 Geology of Wisconsin. Survey of 1878-1879.  
 Annual Report of the Commissioners of Mineral Statistics of Michigan for 1877-8, and previous year. Marquette. 1879. (2 copies.)  
 Report of the Bureau of Agriculture Statistics and Mines for 1876. Nashville, Tenn. 1877.

- Annual Report of the Trade and Commerce of Chicago for 1864, 1866 to 1868, and 1871, 1877 and 1879.
- Annual Report of the Packing of the West. Chicago. 1877.
- Annual Report of the Department of Public Works of Chicago. Chicago. 1878-1879. (2 copies.)
- Communication from the State Engineer of the State of New York, transmitting a Special Report on Coal. Albany. 1865.
- Industrial Arbitration and Conciliation in France and England. Jos. D. Weeks. Pittsburg. 1879. (2 copies.)
- The Methods of Testing Steam Engines, with a description of the Trials of the Blake's Patent Circulating Pumps, on the U. S. S. Tennessee. Philadelphia. 1874.
- The Pacific Railroads and the relations existing between them and the Government of the United States. New York. 1879.
- Report of the Bridging of the Mississippi, between St. Paul and St. Louis. G. K. Warren. Washington. 1878.
- The Agricultural and Mineral Wealth of Tennessee. J. B. Killebrew. Nashville. 1876.
- Memoir of the Iron Bridge over the Missouri River at St. Joseph, Mo., by the Detroit Bridge and Iron Works.
- Proceedings of the Road Masters' Meeting of the Atlantic and Great Western Railroad. Meadville, Pa. 1878.
- Sandvick Exhibition of Bessemer Steel at Philadelphia. 1876.
- Statistics and Information relative to the Trade and Commerce of Buffalo. Buffalo. 1875.
- Annual Report of the Board of Trade of Portland. Portland. 1864.
- Annual Report of the Secretary of the Navy on the Operations of the Department for the year 1877.
- Annual Report of the United States to the Secretary of the Treasury. Washington. 1873.
- Method and Cost of Mining Specular and Magnetic Ores. T. B. Brooks. New York. 1873.
- Chemical Composition of Ores—Analysis. T. B. Brooks. New York. 1873.
- Historical Sketch of the Discovery and Development of Ores. T. B. Brooks. New York. 1873.
- Magnetism of Rocks and Use of the Magnetic Needle in Exploring for Ore. T. B. Brooks. New York. 1873.
- Geology of the Marquette Iron Region. T. B. Brooks. New York. 1873.
- Explorations (Prospecting for Ore). T. B. Brooks. New York. 1873.
- Second Annual Report of the Commission on Steam and Canals. Albany. 1873.
- Directory of the Iron and Steel Works of the United States. Philadelphia. 1880.
- Report of the Transportation Bureau of the Merchants' Exchange of St. Louis. St. Louis. 1873.
- Iron Ores and other Minerals from the New River in Virginia. Philadelphia. 1876.
- An Address at the Reopening of Pardee Hall, Lafayette College, November 30, 1880. Easton, Pa. 1881.
- Testimonial to Alexander Lyman Holley. At the Reception of the American Institute of Mining Engineers, at Pittsburg, May 15, 1879. (Several copies.)
- A General Account of the Commonwealth of Kentucky. Cambridge. 1876.
- Annual Report of the Chief Engineer of the Water Department of Philadelphia. Philadelphia. 1876.
- The Census of Iowa as returned in the year 1869. Des Moines. 1869.
- Safety of Permanent Way, with Drawings and Tables concerning Punching and Notching of Rails. C. P. Sandberg. London. 1874.
- Annual Report of the American Iron and Steel Association, containing the Statistics of the American Iron Trade. Philadelphia. 1879.
- History, Position, Resources and Industries of the State of Wisconsin. Madison. 1875.
- The Iron and Steel Exhibits of the Universal Exposition of 1878 at Paris. Philadelphia. 1879.
- Report of the Select Committee on Transportation Routes to the Seaboard. Washington. 1874.
- Proceedings of the Senate Committee on Transportation Routes to the Seaboard. New York. 1873.
- Resources and Capabilities of the Oil Region of Tennessee. J. B. Killebrew. Nashville. 1877.
- History and Review of the Mineral Resources of Lake Superior. A. P. Swineford. Marquette. 1876.
- Statements of the Coal and River Trade in Opposition to the Davis Island Dam, Washington, D. C.
- Hardening Iron and Steel, its Causes and Effects. R. Ackerman.
- The State of the Iron Manufacture in Sweden. R. Ackerman. Stockholm. 1876.
- Kirkaldy's Experimental Inquiry into the Mechanical Properties of Fagersta Steel. London. 1876.
- Report of a Committee on Repairs of Roads. Boston. 1865.
- Useful Information on Practical Electric Lightning. K. Hedges. London and New York. 1879.
- The Chemical Composition and Physical Properties of Steel Rails. Easton, Pa. 1879.
- Annual Report of the Monongahela Navigation Company. Pittsburg. 1879.
- Report of the Railroad Commissioners of the State of Connecticut for 1880, 1881.
- Memorial of the Chicago and Northwestern and Chicago, Milwaukee and St. Paul Railway Companies. Chicago, 1875, 1876.
- Annual Report of the Michigan Southern and Northern Indiana Railroad Company for 1887.
- Annual Report of the Lake Shore and Michigan Southern Railroad for 1873, 1876 and 1880.
- Report of the Special Committee on Railroads and Telegraphs, made to the Senate of Ohio. 1867, 1868 and 1870.
- Report on the Hudson River Railroad. John B. Jervis. New York. 1846 and 1848.
- Annual Report of the Cleveland and Pittsburg Railroad Company, for 1869, 1870 and 1871.
- Annual Report of the State Engineer and Surveyor of the State of New York, from 1865 to 1868, inclusive. (2 copies.)
- Annual Report of the Water Commissioners of Lowell, Mass., for 1873 and 1878.

- Reports of the Board of Railroad Commissioners of Massachusetts, for 1872 and 1879. Blank Statement of the Massachusetts Railroad Commissioners. 1876.
- Annual Report of the Commissioners of Railroads and Telegraphs of Ohio, for 1871, 1872, 1873, 1875 and 1876.
- Annual Report of the Auditor-General of the State of Pennsylvania, on Railroads and Canals, for 1866, 1867, 1868, 1869, 1870, 1874.
- By-Laws and Organization of the Alleghany Valley Railroad Company. Pittsburg. 1875.
- Annual Reports of the Alleghany Valley Railroad Company, for 1866, 1870, 1873, 1875, 1876, 1877, 1880 and 1881.
- Annual Report of the Pittsburgh, Titusville and Buffalo Railway, for 1876, 1877, 1879 and 1880.
- Report of the Pittsburg, Fort Wayne and Chicago Railway, from 1863 to 1868, inclusive.
- Annual Report of the Railroad Commissioners of Massachusetts, for 1874, 1875, 1876 and 1878.
- Reports of the several Railroad Companies of Pennsylvania, for 1861 and 1864.
- Annual Reports of the Pennsylvania Railroad Company, for 1867, 1870, 1871, 1874, 1875 and 1877.
- Report of the Investigating Committee of the Pennsylvania Railroad Company. Philadelphia. 1874.
- Annual Report of the Railroad Commissioners of Iowa. Des Moines. 1879.
- Report of the New York and Erie Railroad. New York. 1853 and 1856.
- Annual Report of the Grand Rapids and Indiana Railroad Company. Grand Rapids. 1873.
- Tables of Astronomical and Trigonometrical Survey of Massachusetts. J. G. Palfrey. Boston. 1846.
- Annual Report of the St. Louis and South-eastern Railway Company. St. Louis. 1878.
- Report of the Commissioners to Examine the Services from which a supply of pure Water may be obtained for the City of Boston. Boston. 1845.
- Annual Report of the St. Louis, Iron Mountain and Southern Railway Company. St. Louis. 1878.
- Annual Report of the Philadelphia and Erie Railroad Company. Philadelphia. 1879.
- Annual Report of the Auditor of the Canal Department on the Tolls, Trade and Tonnage of the State of New York. Albany. 1867.
- Report of the Commissioners of the Troy and Greenfield Railroad and Hoosac Tunnel. Boston. 1863.
- Annual Report of the New York Central Railroad Company. Albany. 1866.
- Revised By-Laws and Organization of the Pennsylvania Company. Pittsburg. 1873. (2 copies.)
- Annual Report of the Pittsburg, Cincinnati and St. Louis Railway Company. Philadelphia. 1880.
- Tabulated Results compiled from the Annual Reports of Railroad, Passenger Railway, Canals and Telegraph Companies of Pennsylvania. Harrisburg. 1875.
- Proceedings of the Annual Meeting of the Stockholders of the Pennsylvania Railroad Company. Philadelphia. 1867.
- Report of Experiments with Coal-Burning Locomotives, made on the Pennsylvania Railroad. Philadelphia. 1860.
- Annual Report of the North Pennsylvania Railroad Company. Philadelphia. 1869.
- Annual Report of the Grand Rapids and Indiana Railroad Company. Fort Wayne. 1869.
- Cost, Revenue and Expenditure of the Public Works of Pennsylvania. Harrisburg. 1854.
- Report of the President and Directors of the Seaford and Roanoke Railroad Company. Norfolk. 1874.
- Report of the Indianapolis, Cincinnati and Lafayette Railroad Company. Cincinnati. 1875.
- Report on the Question of Bridging the Missouri River. J. L. Williams. Fort Wayne. 1867.
- Report of the Central Railroad and Banking Company of Georgia. Savannah. 1875.
- Report of the Chief Engineer of the Union Pacific Railroad. G. M. Dodge. Washington. 1868.
- Report of the Consulting Engineer of the Union Pacific Railroad. Silas Seymour. New York. 1866.
- The Proposed American Inter-Oceanic Canal in its Commercial Aspects. Joseph Nimmo. Washington. 1880.
- The Census of Iowa, as returned in the year 1867.
- Description of the Croton Aqueduct. John B. Jervis. New York. 1842.
- Report of the Chief Engineer of the Providence Water Works. Providence. 1871.
- Description of the Boston Water Works. 1878.
- Proceedings of the Railroad Convention, held at the St. Nicholas Hotel, New York. Albany. 1860.
- Annual Report of the American Railway Master Mechanics' Association in Convention at Boston. Cincinnati. 1872.
- Report upon the Proposed Railway from Pittsburg, Pa., to the James River Valley. Va.

## LIST OF MEMBERS.

## ADDITIONS.

## MEMBERS.

Date of Election.

KNAP, JOSEPH M. .... 365 West St., New York City, N. Y. .... April 5, 1882.  
 SICARD, MIRTILIANO ..Ibagué, Tolimo, U. S. Colombia. .... Jan. 4, 1882.

## ASSOCIATE.

LOCKWOOD, JOHN. .... Gas and Hydraulic Engineer, 61 Broad-  
 way, New York City, N. Y. .... April 5, 1882.

## JUNIOR.

KELLY, CASSIUS W. .... 18 City Hall, New Haven, Conn. .... March 1, 1882.

## CHANGES AND CORRECTIONS.

## MEMBERS.

ANDERSON, THOMAS S. ... San Antonio, Texas.  
 BELKNAP, MORRIS S. .... Supt. M. and M. Div. L. & N. R. R. Montgomery, Ala.  
 BLICKENSDECKER, R. .... Div. Eng. and Supt. Constr. Utah & Northern R. R.  
 Silver Bow Junction, Montana.  
 BRIGGS, ROBERT. .... 1125 Girard St., Philadelphia, Pa.  
 BRUNER, D. P. .... 110 N. Second St., Harrisburg, Pa.  
 DEFREES, M. M. .... Engr. in Chg. Bridges and Buildings, Ind. B. & W.  
 R. R. and Ohio So. R. R., Indianapolis, Ind.  
 GLOVER, O. L. .... Pittsfield, Mass.  
 GOULD, JAMES P. .... Buxton P. O., Traill Co., Dakota.  
 HYDE, WILLIAM B. .... Custer City, Idaho.  
 LOW, GORHAM, P., Jr. .... Supt. Road Dept. E. C. & N. R. R., Norfolk, Va.  
 MCCLINTOCK, W. H. .... Supt. Road Dept. L. & N. R. R., Louisville, Ky.  
 MEIGS, MONTGOMERY ... U. S. Civil Engineer, Keokuk, Ia.  
 MERRILL, WILLIAM F. ... Asst. Gen. Supt. W., St. L. & P. R. R., St. Louis, Mo.  
 NICHOLSON, GEORGE B. ... Engr. South. Div. N. O. & N. E. R. R., New Orleans, La.  
 NOBLE, ALFRED. .... U. S. Asst. Engineer, Sault Ste. Marie, Mich.  
 POST, LEVI W. .... Lock Box 18, Memphis, Tenn.  
 PREVOST, S. M. .... Supt. Phila. Div. P. R. R., W. Philadelphia, Pa.  
 YARDLEY, EDMUND. .... Master of Road, Pittsburg Div. B. & O. R. R., Connells-  
 ville, Pa.

## JUNIOR.

BUTTS, EDWARD.....Union Pacific R'w'y., Room S., Union Depot, Denver,  
Colo.

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## DEATHS.

FORSHEY, CALEB G.....Elected Member August 7, 1872 ; died April, 1872.  
HOWELL, CHARLES W...Elected Member, March 3, 1875 ; died April 5, 1882.

# American Society of Civil Engineers.

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## PROCEEDINGS.

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Vol. VIII.—May, 1882.

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### MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

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#### ANNUAL CONVENTION OF THE SOCIETY.

HELD IN THE CITY OF WASHINGTON, D. C., ON THE 16TH, 17TH, 18TH  
AND 19TH OF MAY, 1882.

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#### FIRST SESSION.

TUESDAY, MAY 16TH, 1882.—The Convention was called to order at 10 A. M. by Mr. JOHN BOGART, Secretary of the Society, who requested the President, Mr. ASHBEL WELCH, to temporarily take the Chair. The Secretary then read the provisions of the By-Laws relating to Conventions. In accordance with these provisions and with the custom the Committee of Members resident in Washington was requested to nominate a permanent Chairman of the Convention. The Chairman of that Committee, Col. T. L. CASEY, Director of the Society, thereupon nominated Gen. HORATIO G. WRIGHT, Chief of Engineers, U. S. A., which nomination was seconded and ratified by the Convention, and he was declared elected permanent Chairman.

The President of the Society thereupon announced that, on account of severe illness, Gen. Wright was unable to leave his house that morning, although he had fully hoped and expected to be present. Under these circumstances the President suggested that until the Chairman should be able to meet with the Convention, another member should be chosen as Chairman *pro tempore*. Thereupon, on nomination, Col. THOMAS L. CASEY was elected Chairman *pro tempore*.



Col. CASEY, on taking the Chair, informally welcomed the Society to the City of Washington, and referred to the works of engineering interest in it and its vicinity. The President of the Society made a short response.

The Secretary then announced the details of the programme for each day.

A paper entitled "An Instance of Zymotic Disease in Metals," by O. E. Michaelis, Member A. S. C. E., was read by the author and discussed by T. Egleston, Member A. S. C. E.

The subject of a place for holding the next Annual Convention was considered, and D. J. Whittemore, Member A. S. C. E., suggested the City of Minneapolis, Minn., presenting reasons for holding the Convention at that place. T. Egleston, Member A. S. C. E., suggested the consideration of some point in the extreme West as desirable for a future Convention. The determination of this question was postponed until the next Annual Meeting.

The report of the Committee upon a Uniform System for Tests of Cement was then read by the Chairman of the Committee as follows :

MILWAUKEE, May 6, 1882.

JOHN BOGART, Esq.,

*Secretary American Society of Civil Engineers :*

DEAR SIR,—As chairman of the committee for devising a uniform system of cement tests, I regret to report that my professional duties as Chief Engineer of the Chicago, Milwaukee & St. Paul Railway Co. (now operating 4,300 miles of road, 430 of which was built under my supervision the last year) have prevented me from giving the matter of cement tests but slight attention. Had the time been at my disposal I could not report understandingly on mortars composed of cement and sand, owing to the fact that but very few of the Engineers of this Society have responded to the call for sands from their several localities, without which it is impossible to select a standard sand that can be easily obtained by all experimenters. It is quite probable, that during the present year my professional duties will be such that I shall be unable to properly act as chairman of said committee, and it would be a relief to me if the directors of your Society would indicate some other person who has the time to devote to this important subject, to act as chairman in my place.

All of which is respectfully submitted.

D. J. WHITTEMORE,  
*Chairman.*

On motion of Charles E. Fowler, M. A. S. C. E., the report was accepted and the same committee continued.

The Convention then adjourned until 1.30 P. M.

## SECOND SESSION.

TUESDAY, MAY 16TH, 1.30 P. M.—The Convention was called to order, and in the temporary absence of the Chairman, O. E. Michaelis, M. A. S. C. E., was requested to preside.

The Secretary presented invitations to visit the offices of the United States Coast and Geodetic Survey, also the Museum of the Ordnance Department, the Corcoran Art Gallery and the Cosmos Club, which invitations were accepted.

The report of the Committee on the Preservation of Timber was presented and read by O. Chanute, Chairman of the Committee.\* Messrs. J. W. Putnam and E. R. Andrews, of the Committee, also presented communications on this subject.

The Convention then adjourned till 8 P. M. The members at 3 P. M. visited the Capitol and the offices of the Coast and Geodetic Survey.

## THIRD SESSION.

TUESDAY, MAY 16TH, 8 P. M.—The Convention was called to order, Col. T. L. Casey, Director A. S. C. E., in the Chair. The President of the Society, Mr. ASHBEL WELCH, then delivered his annual address.†

Upon the conclusion of the address the Secretary announced that at 10 A. M. of the following morning a visit would be made to the Washington Monument, and requested Col. T. L. Casey, Engineer in charge of that work, to give some information as to its condition and progress.

Col. T. L. Casey then informally addressed the Convention upon this subject.

After a number of announcements by the Secretary the Convention adjourned until May 17th, at 2 P. M.

NOTE.—On Wednesday morning, May 17th, a visit was made to the Washington Monument, and the work in progress inspected under the guidance of Col. T. L. Casey. Visits were also made to the Sewerage Works of the City, under the charge of the Engineers of the District Commission, the party being conducted by Lieut. R. L. Hoxie, Corps of Engineers, U. S. A. Also to the works where the Asphaltic Material for Street Pavements are prepared, which were explained by D. E. McComb, M. A. S. C. E. Visits were also made to the Bureau of Engraving and Printing, Department of Agriculture and Smithsonian Institution.

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\* Will be published hereafter.

† Published in Transactions.

## FOURTH SESSION.

WEDNESDAY, MAY 17TH, 2 P. M.—The Convention was called to order, Col. T. L. Casey, Director A. S. C. E., in the Chair. The report of the Committee on the Preservation of Timber was discussed by Messrs. J. B. Francis, T. Egleston, M. Cohen, F. Collingwood, E. R. Andrews, L. Bridges, Clemens Herschel, A. Gottlieb, T. F. Rowland and John Bogart.

A paper by A. G. Menocal, M. A. S. C. E., entitled Subaqueous Underpinning,\* was read by the Secretary and discussed by members present.

The business meeting of the Society then occurred, for minutes of which see page 71.

After the business meeting the session of the Convention was resumed, Col. F. U. Farquhar, M. A. S. C. E. in the Chair. On motion the discussion of the Subject of Structural Materials was made the order for 8.30 P. M.

Announcements were made and the Convention then adjourned until 8 P. M.

## FIFTH SESSION.

WEDNESDAY, MAY 17TH, 8 P. M.—The Convention was called to order, Col. T. L. Casey, Director A. S. C. E., in the Chair.

A paper on the Overflow of the Mississippi River, by Lyman Bridges, M. A. S. C. E., was discussed by the author and E. L. Corthell, M. A. S. C. E.\*

The subject of Tests of Structural Materials was then taken up and discussed by Messrs. A. Dempster, T. Egleston, F. Collingwood, A. Gottlieb, O. E. Michaelis, O. Chanute, T. C. Clarke, T. L. Casey, J. J. R. Croes, John Bogart, A. Coffin, A. P. Boller, J. P. Davis and Theodore Cooper.

The Convention then adjourned until 3 P. M., May 19th.

NOTE.—On Thursday, May 18th, at 10 A. M., an excursion was made by steamboat on the Potomac to Mount Vernon. Several hours were spent at that place, and on returning the party was landed at the Washington Navy Yard, where, under escort of Civil Engineer A. G. Menocal, M. A. S. C. E., and the officers of the Navy Yard, an inspection was made of various matters of interest.

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\* To be published in Transactions.

On the evening of Thursday a reception was given at Willard's Hall and Hotel by the President of the Society, Mr. Ashbel Welch. This reception was attended by the members of the Society and their families, and by a large number of invited guests.

On Friday, May 19th, at 9 A. M., an excursion was made in carriages to the Washington Aqueduct, and to the Cabin John Bridge, the stone arch of 220 feet span carrying that aqueduct over a stream about seven miles distant from Washington.

In returning a visit was made to the Inclined Plane and Caisson connecting the Canal and River at Georgetown.

At 3 P. M. the same afternoon the members of the Society and their families were received at the Executive Mansion by the President of the United States, after which the Conservatory and all the rooms of the White House were thrown open for inspection.

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#### SIXTH SESSION.

FRIDAY, MAY 19TH, 4 P. M.—The Convention was called to order, Col. T. L. Casey, Director A. S. C. E., in the Chair.

A paper by William Sooy Smith, M. A. S. C. E., on the Hudson River Tunnel, was read by the Secretary and discussed by W. H. Paine, M. A. S. C. E.

The following papers were presented by the Secretary and read by title, the time determined for the adjournment of the Convention preventing their being read in full.

Description of some experiments on the Flow of Water, made during the construction of works for conveying the water of Sudbury River to Boston : A. Fteley and F. P. Stearns.

Targets for Rifle Ranges : O. E. Michaelis.

Accuracy of Measurement as increased by Repetition : S. S. Haight.

Highway Bridges : James Owen.

On motion of J. James R. Croes, Treasurer A. S. C. E., it was resolved that the thanks of the Society in Convention assembled be presented to Col. T. L. Casey, Chairman *pro tempore*, and also to the local committee of members resident at Washington, who have been in charge of the arrangements for the Convention and to others who have aided in carrying out these arrangements.

Upon motion, the Chairman *pro tempore*, with a few remarks, declared the Convention adjourned *sine die*.

NOTE.—On Saturday morning, May 20th, an excursion was made to Pen-Mar. This excursion was tendered through the kindness of the Pennsylvania, the Baltimore and Potomac, and the Western Maryland Railroads, and was under the immediate escort of Mr. H. F. Walling, M. A. S. C. E.

The company left Washington at 8.30 A. M., proceeded to Baltimore, and thence to Pen-Mar Station. Carriages were then taken to High Rock, an elevated point of the Blue Ridge Mountains.

The Heliostat operations as used by the United States Coast and Geodetic Survey were here exhibited.

After lunch at Pen-Mar, the party returned to Baltimore in time to take the evening trains both North and South.

The following is a copy of the printed programme issued to the members present :

### PROGRAMME.

**TUESDAY, MAY 16TH, 10 A. M.**—Meeting for organization, Willard Hall, F. Street, between 14th and 15th. Selection of Officers of Convention ; Reading of Papers and Professional Discussion.

1.30 P. M.—Meeting ; Reading of Papers and Professional Discussion.

3 P. M.—Visit to Capitol.

8 P. M.—Meeting ; Annual Address by Ashbel Welch, Esq., President of Am. Soc. of Civil Engineers.

**WEDNESDAY, MAY 17TH, 10 A. M.**—Visit to Washington Monument.

2 P. M.—Meeting ; Reading of Papers and Professional Discussion.

3 P. M.—Regular Meeting of the Society for transaction of business.

8 P. M.—Meeting ; Reading of Papers and Professional Discussion.

**THURSDAY, MAY 18TH, 10 A. M.**—Excursion on Potomac ; Examination of Harbor of Washington and Excursion to Mount Vernon ; on return, visit to Washington Navy Yard, from 4 to 6 P. M.

8.30 P. M.—Reception by President of the Society at Willard Hall and in parlors of Willard's Hotel.

**FRIDAY, MAY 19TH, 9 A. M.**—Excursion to Washington Aqueduct, Cabin John Bridge, and the Inclined Plane and Caisson connecting Canal and River at Georgetown.

3 P. M.—Meeting ; Reading of Papers and Professional Discussion.

**SATURDAY, MAY 20TH.**—An Excursion to Pen-Mar has been arranged for this day, which will be so timed as to enable members to reach New York if desired at 10.20 P. M.

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The following papers will be presented and discussed :

The Hudson River Tunnel : Gen. Wm. Sooy Smith.

Description of some experiments on the Flow of Water, made during the construction of works for conveying the water of Sudbury River to Boston : A. Fteley and F. P. Stearns.

Subaqueous Underpinning : A. G. Menocal, U. S. N.

Targets for Rifle Ranges : Capt. O. E. Michaelis.

Peculiar Phase of Metallic Behavior : Capt. O. E. Michaelis.

Accuracy of Measurement as Increased by Repetition : S. S. Haight.

Highway Bridges : James Owen.

Papers presented to the Society during the past year will also be discussed.

Reports will be expected from the Committees on Standard Time ; on the Preservation of Timber ; on Testing Cements, and those subjects will be discussed.

The proposed provisions for testing iron, steel and other structural materials, will also be discussed.

Headquarters of the Society, Parlor No. 10, Willard's Hotel.

### COMMITTEES.

Local Committee : Chairman, Col. T. L. Casey, U. S. A.

On Programme : Genl. H. G. Wright, U. S. A. ; Prof. J. E. Hilgard, U. S. C. and G. S.

On Entertainment and Finance : A. G. Menocal, Civil Engineer U. S. N. ; Col. F. U. Farquhar, U. S. A. ; J. B. Dunklee.

On Transportation : S. Thayer Abert, Ed. L. Du Barry.

On Hotel Accommodation : David E. McComb, H. F. Walling.

The following members were in attendance at the Convention : —S. Thayer Abert, Washington, D. C. ; W. M. Allaire, E. R. Andrews, New York City ; George D. Ansley, Montreal, Canada ; W. S. Barbour, Cambridgeport ; H. Bissell, Salem, Mass. ; H. D. Blunden, John Bogart, A. P. Boller, New York City ; L. L. Buck, Brooklyn ; W. H. Burr, Troy, N. Y. ; A. Bonzano, Phoenixville, Pa. ; G. Bouscaren, Cincinnati, Ohio ; Onward Bates, St. Louis, Mo. ; J. D. Burr, Topeka, Kansas ; Lyman Bridges, San Francisco, Cal. ; S. H. Chittenden, East River, Conn. ; O. Chanute, T. C. Clarke, F. Collingwood, Theodore Cooper, E. L. Corthell, J. J. R. Croes, New York City, N. Y. ; Amory Coffin, Phoenixville, Pa. ; Mendes Cohen, Baltimore, Md. ; T. L. Casey, Washington, D. C. ; J. P. Davis, New York City ; W. A. Doane, Oswego, N. Y. ; E. L. Du Barry, John B. Dunklee, Washington, D. C. ; Charles Davis, Alleghany City ; A. Dempster, Pittsburgh, Pa. ; Fred. De Funiak, Louisville, Ky. ; T. Egleston, New York City, N. Y. ; Robert Fletcher, Hanover, N. H. ; Edward A. Flint, A. Fteley, Boston ; James B. Francis, Lowell, Mass. ; Charles A. Ferry, Charles E. Fowler, New Haven, Conn. ; John W. Ferguson, Hornellsville, N. Y. ; Clark Fisher, Trenton, N. J. ; F. U. Farquhar, Washington, D. C. ; C. G. Force, Cleveland, Ohio ; Sandford Fleming, Ottawa, Canada ; George S. Greene, George S. Greene, Jr., New York City, N. Y. ; F. Graff, Philadelphia ; A. Gottlieb, Pittsburgh, Pa. ; Chas. E. Goad, [Montreal, Canada ; Clemens Herschel, Holyoke, Mass. ; A. B. Hill, New Haven, Conn. ; S. S. Haight, Wm. G.

Hamilton, New York City, N. Y.; J. E. Hilgard, Washinton, D. C.; J. H. Harlow, Pittsburgh, Pa.; Wm. P. Harris, Huntington, W. Va.; Charles Hermany, Louisville, Ky.; Geo. A. Kimball, Somerville, Mass.; L. H. Knapp, Buffalo, N. Y.; T. C. Keefer, Ottawa; John Kennedy, Montreal, Canada; C. H. Latrobe, Baltimore, Md.; G. P. Low, Jr., Norfolk, Va.; W. H. Lotz, Chicago, Ill.; Louis Lesage, Montreal, Canada; T. C. McCollom, New London; T. H. McKenzie, Southington, Conn.; G. W. McNulty, Brooklyn; George S. Morrison, New York City; D. N. Melvin, New Springville, N. Y.; O. E. Michaelis, Philadelphia, Pa. D. E. McComb, A. G. Menocal, Washington, D. C.; Alfred Noble, Sault Ste. Marie, Mich.; L. F. Olney, Middletown, N. Y.; J. A. Ockerson, St. Louis, Mo.; S. C. Pierson, Meriden, Conn.; W. H. Paine, F. C. Prindle, Brooklyn, N. Y.; George H. Pegram, Wilmington, Del.; O. M. Poe, Washington, D. C.; J. W. Putnam, New Orleans, La.; Joseph R. Richards, Boston, Mass.; Thomas F. Rowland, Greenpoint, N. Y.; Wm. M. Reed, Erie; David Reeves, Phoenixville, Pa.; F. P. Stearns, Boston, Mass.; W. H. Searles, Newburg, N. Y.; S. M. Smedley, Philadelphia, Pa.; R. A. Shailer, Wilmington, Del.; J. G. Van Horne, Jersey City, N. J.; Wm. H. Wiley, Wm. E. Worthen, New York City, N. Y.; C. D. Ward, L. B. Ward, Jersey City; Ashbel Welch, Lambertville, N. J.; H. F. Walling, Washington, D. C.; T. J. Whitman, St. Louis, Mo.; D. J. Whittemore, Milwaukee, Wis.; J. A. L. Waddell, Council Bluffs, Iowa.

NOTE.—Forty-eight ladies of the families of members accompanied them on their visit to Washington on the occasion of this Convention.

### MEETINGS OF THE SOCIETY.

APRIL 19TH, 1882.—The Society met at 8 P. M., Mr. George W. Dresser, Director A. S. C. E. in the Chair.

The deaths of Capt. C. W. Howell, Corps of Engineers, U. S. A., elected member March 3d, 1875, died April 5th, 1882; and of C. G. Forshey, elected member August 7th, 1872, died April, 1882, were announced.

Plans and profiles of works proposed for the drainage of the Valley and City of Mexico were exhibited and explained by Mr. Ricardo Orozco, C. E.

MAY 3D, 1882.—The Society met at 8 P. M., President Ashbel Welch in the Chair.

Ballots for membership were canvassed and the following candidates declared elected as members: William Giddings Curtis, San Francisco, California; Edward C. Kinney, Des Moines, Iowa; Gustav Lindenthal,

Pittsburgh, Pennsylvania ; Thomas Chalmers McCollom, New London, Connecticut ; David Reeves, (elected Junior April 1st, 1874,) Phoenixville, Pennsylvania.

The Secretary announced the general programme for the approaching Convention as arranged at a meeting by him with members resident at Washington.

A paper by William R. Hutton, M. A. S. C. E. on the Improvement of the Potomac River, at Washington, was read by the Secretary and discussed by Messrs. Bridges, Bogart, Emery and Haswell.

MAY 17TH, 1882.—Business meeting at the Annual Convention. The meeting of the Society for the transaction of business was called to order, the President Mr. Ashbel Welch in the Chair.

The President stated the action of the Board of Direction of the Society upon the subject of the introduction and framing of a law adequate to resume the investigation into the strength of structures, and the parts and materials of which they are composed, which subject had been referred to the Board at the last Annual Meeting.\* A copy of the bill which had been introduced in Congress was presented as follows :

#### TESTS OF STRUCTURAL MATERIALS.

\* NOTE.—The Bill of which the following is a copy, was introduced in the House of Representatives March 1st, 1882, by Hon. J. M. Campbell, Chairman of the Committee on Manufactures, read twice and referred to that Committee. The Bill is numbered H. R. 4,726.

#### A BILL

Authorizing the President to appoint a commission of experts, skilled in the investigation, production and use of metallic substances and other structural materials, to execute tests and experiments on iron, steel and other materials used in the construction of bridges, buildings and mechanical structures, and deduct useful rules therefrom.

*Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled :*

SEC. 1. That the President of the United States be and he is hereby authorized to appoint a commission of seven members selected from among men skilled in the investigation, production and use of metallic substances and other structural materials, to hold their appointment during the pleasure of the President of the United States ; which commission shall plan and superintend the execution of such tests and investigations of materials used extensively in the construction of buildings, bridges, ships and other structures and machinery, as it shall think

\* See Proceedings, Vol. VIII, January, 1882, p. 28



most important to be made, and from time to time publish results of the tests and investigations, and also such scientific principles and such practical rules deduced therefrom as it shall consider most useful. The said commission shall organize itself, and adopt such rules, and make such assignment of duties among its members as it shall deem most promotive of the object of its appointment. Vacancies occurring from time to time in said commission shall be filled by the President of the United States.

SEC. 2. That the said commission shall report its work with its results and the deductions made therefrom, annually to the Secretary of the Interior, and its accounts shall be settled in the Interior Department, through such channels as the Secretary shall direct.

SEC. 3 That the members of said commission shall be entitled to mileage and other necessary expenses incurred in the prosecution of their duties, but no salaries as members of the commission.

SEC. 4. That the said commission is hereby authorized to appoint a principal expert who shall personally conduct the examinations and tests which the commission shall direct, with such assistants and laborers as may be necessary, and also to purchase such material for test and investigation as may from time to time be required.

SEC. 5 That this act shall take effect immediately.

The subject of Tests of Structural Materials was discussed by Messrs. Coffin, Dempster, Egleston, Michaelis, Richards and Welch.

The following nominating Committee was appointed in accordance with Section 24 of the By-Laws: D. J. Whittemore, of Milwaukee, Wis.; Albert Fink, of New York; A. Gottlieb, of Pittsburgh, Pa.; Charles H. Latrobe, of Baltimore, Md.; and Sandford Fleming, of Ottawa, Canada.

The death of Gen. John G. Barnard, Corps of Engineers, U. S. A., Honorary Member of the Society; elected member September 15th, 1869; elected Honorary Member April 7th, 1873; died May 14th, 1882, was announced.

The award of the Norman Medal for the past year was announced. The paper for which the medal is awarded is No. COXXIII, published in Transactions, Vol. X, July, 1881. The subject of the paper is "The Re-enforcement of the Anchorage, and Renewal of the Suspended Superstructure of the Niagara Railroad Suspension Bridge." The author of the paper is Mr. L. L. Buck, M. A. S. C. E.

The report of the Committee on Standard Time was presented and read by the Chairman, Mr. Sandford Fleming, as follows:

The Special Committee on Standard Time beg leave to submit the following report:

At the Annual Meeting of the Society on the 18th January, last, resolutions were passed directing the Committee to take such steps as seemed to them advisable to obtain some expression of general opinion on the

important question of the establishment of Standard Time, with the view of submitting some definite recommendations as to the course it may seem expedient to take.

In accordance with these instructions the Committee issued the pamphlet herewith submitted, containing various documents bearing on the question. This *brochure* has been widely circulated, in every State of the Union, in the adjoining British provinces, and in Mexico. A series of questions prepared with the view of eliciting all shades of opinion were sent with the pamphlet, and attention to them at an early period was asked.

Replies have been received from many prominent men connected with the profession, with railways, with telegraphs, and with scientific bodies, and additional answers from the more distant parts of the continent are daily arriving.

The character of the replies received to date has been classified. The following synopsis may be presented along with each question:

Question 1.—Are you in favor of a comprehensive system of Standard Time for North America?

The replies to this question may be said to be unanimous. The opinion is emphatically expressed that there should be established, as early as possible, a comprehensive system of Standard Time for North America.

Question 2.—Do you favor the idea expressed in some of the documents referred to, of bringing the Standards of Time of all countries into agreement?

Ninety-five per cent. of the answers are in the affirmative; five per cent. in the negative.

Question 3.—In order to attain the object set forth in question No. 2, do you consider it advisable to secure a time system for this country which would commend itself to other nations, and be adopted by them ultimately?

Ninety-five per cent. of the answers are in the affirmative, and the opinion is frequently expressed that while we must primarily look to our own convenience on this continent, as we are likely to be the first to adopt a reformed time system, we should, from the first, make provision for its universal application. Five per cent. of the answers are adverse.

Question 4.—Referring to the scheme for regulating time (page 28 of pamphlet issued by the Society), does it seem to possess any features which generally commend themselves to your judgment?

About ninety-seven per cent. of the answers are in the affirmative—3 per cent. in the negative.

Question 5.—Do you favor the proposal to have the standards of time differing by intervals of one hour, thus reducing the number of standards for the whole of North America to four, viz.: Meridians Q, R, S and T? (See 18 to 21, pages 30 and 31.)

Seventy-six per cent. of the answers are in the affirmative—twenty-four per cent. adverse.

Question 6.—Do you favor the suggestion to reduce the number of standards in North America to two, say Meridians U. and R. ? (See 21.)

Six per cent. are favorable—ninety-four per cent. adverse.

Question 7.—Do you prefer having only one Continental Standard, say Meridian S, and having one uniform time throughout the whole of North America ? (See 21, page 31.)

Thirty-six per cent. are in the affirmative—Sixty-four per cent. in the negative.

Question 8.—If the scheme set forth in the document referred to (page 28) does not generally meet with your approval, is there any other scheme which you prefer ? Please explain your preference for the information of the Committee.

The scheme is very generally and cordially approved. Several suggestions are made which are entitled to great respect.

Question 9.—Referring to the suggestions under the heading "Division of the Day into Hours" (page 31) please indicate which of the three following plans you prefer.

(A) The alternative plan No. 1, with the hours numbered from 1 to 24 without interruption ?

Ninety-two per cent. are in favor of a notation of 1 to 24—eight per cent. are adverse.

(B) The alternative plan No. 2, with the forenoon hours numbered as at present and the afternoon hours lettered as described ?

Eleven per cent. are in favor—eighty-nine per cent. against this plan of notation.

(C) The present division into half days, known as forenoon and afternoon, each half day having the hours numbered identically from 1 to 12 ?

Thirty-three per cent. are in favor and sixty-seven per cent. against the present system of dividing the day into two sets of hours, numbered from one to 12 and known as A. M. and P. M.

Question 10.—In order to secure perfect uniformity and accuracy, do you favor the proposal to have Standard Time disseminated throughout the country by central authority controlled by government ? (Page 30.)

Ninety per cent. are in favor of the proposal, ten per cent. against. In the latter the view is generally expressed that on account of the vast extent of the country there should be various central observatories, all operating in harmony and mutually assisting each other in the work of disseminating accurate time.

Question 11.—Have you any particular views on the question of Time Reform, not embraced in the questions and replies above given ? If so, please state them for the information and guidance of the Committee. (If necessary, on a separate sheet.)

A very small percentage take an unfavorable view or propose modifications of the scheme submitted. The large majority are decidedly in favor of reform without delay. Much valuable information has been brought out which the Committee recommend should be printed.

It will be seen from the character of the replies received that a remarkable unanimity of opinion prevails in every section of the country heard from.

The Committee feel warranted in reporting that judging from the replies received there is a strong general feeling in favor of establishing a comprehensive system of Standard Time on the basis of the scheme set forth in the papers submitted. That an emphatic opinion has been expressed in favor of having four main standard meridians for the continent, distinguished as Q, R, S and T, or by such geographical names as may hereafter be adopted, and that a large majority of opinions expressed are in favor of numbering the hours in each day from 1 to 24 consecutively.

The opinion has also been generally expressed that while our time system should be in harmony with that of other nations, the necessity for reform on this continent is so urgent that we should not wait for other nations to move in the matter. That we should, as soon as practicable, inaugurate a system, the primary object of which would be to meet our own requirements. But that in taking the initiative we should by all means adopt a system capable of extension to the whole globe, and that we should, to some extent, give other nations an opportunity of co-operating with us.

The Committee accordingly recommend that steps be taken to obtain the establishment of a zero meridian which would be common to all nations for reckoning time and longitude, and that concurrence with this measure be sought from as many nationalities as may be induced to assist in this determination.

That efforts be made to lead to the acceptance of this course on the other Continents to the fullest extent.

That failing in this effort the people of the Western Continent determine a zero meridian for their own use and guidance and especially with the view of establishing a system of Standard Time.

SANDFORD FLEMING,

*Chairman of Committee.*

WASHINGTON, 17 May, 1882.

The subject of Standard Time was discussed by Messrs. Egleston, Hilgard and Fleming.

On motion of Mr. J. B. Francis, past President A. S. C. E., the following resolution was adopted.

*Resolved*, That this meeting entirely concurs in the recommendations contained in the report submitted, and that the Committee be requested, and is hereby authorized to continue their efforts to effect the objects set forth, and also to petition the Congress of the United States to take the necessary steps to have a prime or zero meridian established.

The report of the Committee on the Preservation of Timber was then discussed by Messrs. Collingwood, Bogart, Egleston, Chanute, Andrews, Gottlieb, and on motion the subject of the Preservation of Forests was referred to the same Committee.

#### ADDITIONS TO

### LIBRARY AND MUSEUM.

From F. H. Hamlin, Deputy Commissioner, Department of Public Works New York :

Contract and Specifications for furnishing materials and labor for building one Floating Swimming Bath.

Proposals for Estimates for furnishing Illuminating Gas for lighting the Public Markets, Armories, Buildings and Offices of the City of New York, for the period from January 1, 1881, to December 31, 1881.

Proposals for Estimates for furnishing the Gas or other Illuminating Material for, and Lighting, Extinguishing, Cleaning, Repairing and Maintaining the Public Lamps (and supplying gas, etc., for new lamps when required) on the Streets, Avenues, Piers, Parks and Places in the City of New York, for the period of one year, from May 1, 1881, to April 30, 1882.

Proposals for furnishing materials and performing work in the alteration of Essex Market.

Proposals for furnishing materials and performing work in the erection of portions of Fulton Market.

Proposals for furnishing materials and performing work in the alteration of Tompkins Market.

Proposals for Regulating and Paving with Granite-block Pavement, One Hundred and Eighth Street, from Third to Fifth Avenue.

Proposals for Regulating and Paving with Granite-block Pavement.

Proposals for Regulating and Paving with Macadamized Pavement, Fifth Avenue from the present crosswalk on the north side of Ninetieth Street, to a line five feet south of and parallel with the south curb of One Hundred and Tenth Street, except where heretofore paved, and paving the gutters and intersections with Belgian or Trap-block pavement, and laying crosswalks of Blue-stone, as indicated upon the

map on file in Department of Public Works, which more specifically sets forth the exact nature and extent of all the abovementioned.

Proposals for Regulating and Paving with Macadamized Pavement.

Proposals for Regulating and Paving with Trap-block Pavement the roadway of Eighty-third Street, from the west crosswalk of Eighth Avenue to the pavement heretofore laid at the intersection of the Boulevard, and extending at the several intersecting avenues from a line five feet north of and parallel with the north curb of Eighty-third Street, and laying crosswalks of three courses of blue-stone on the east side of the Boulevard, and on both sides of the intersecting avenues, where not already laid across Eighty-third Street, within the lines of the sidewalks of said avenues and Boulevard, and parallel therewith; also laying crosswalks of two courses of Blue-stone at the intersecting avenues adjoining the above described pavements.

Proposals for Regulating and Paving with Trap-block Pavement.

Proposals for Estimates for Regulating and Grading One Hundred and Twelfth Street from the west curb line of Sixth Avenue to the east curb line of Seventh Avenue, and Setting Curb Stones and Flagging Sidewalks therein.

Proposals for Sewer in Fifteenth Street, between Irving Place and Fourth Avenue, from end of present Sewer in Fifteenth Street.

Proposals for Sewers in Front Street, between Broad Street and Old Slip, and in Centies Slip, between Front and South Streets.

Proposals for Laying Croton Water Mains in 166th, 137th, 169th and 106th Street, in St. Ann's, Madison, Bergen and Third Avenue, and in Terrace Place and Delmonico Place.

Proposals for furnishing, delivering and laying a Forty-eight inch Cast-iron Con-

- duit Pipe from Kensico to a point between Hartedale and Scarsdale, Westchester County, New York.
- Proposals for furnishing Cast-iron Water Pipes, Branch Pipes and Special Castings. Proposals for furnishing and delivering Stop Cocks, Stop Cock Boxes and Hydrants.
- From C. H. Swan, Boston, Mass.: Reports of the Brooklyn Water Works. Vol. I, from 1860 to 1865 inclusive. Vol. II, from 1866 to 1871 inclusive.
- Annual Reports of the Board of Commissioners of City Works for the years 1872 and 1873. Brooklyn.
- Fifth Annual Report of the Boston Water Board. 1881. Boston.
- Report of Select Committee on Water Works. Investigation of Cincinnati. 1873.
- Twenty-fifth Annual Report of the Board of Water Commissioners of Detroit for the year 1876. Detroit. 1877.
- Evansville Water Works. Report of the Expert on the Contract Trials of the Gaskill Compound Pumping Engine. February, 1881. Cincinnati.
- Fifth Annual Report of the Water Commissioners of Fitchburg. Fitchburg. 1874.
- Second Annual Report of the Watuppa Water Board of Fall River. Jan. 1, 1876. Fall River, Mass. 1876.
- Report of the North Hudson Co. Water Commissioners on the Proposed New Water Works for Hoboken, Weehawken, West Hoboken, and Town of Union, N. J. Jersey City. 1873.
- Jersey City Water Reports. 1851 and 1861, 1862-1871, inclusive. Jersey City.
- Report of the Chief Engineer for 1871. Jersey City. 1872.
- Final Report of the Water Commissioners of the City of Lawrence. Lawrence, Mass. 1876.
- First and Third Annual Reports of the Lawrence Water Board for the years 1876 and 1878.
- Louisville Water Co. Reports for the years 1871, 1872 and 1873. Louisville.
- Annual Reports of the Water Commissioners of Lowell, Mass., for the years 1870, 1871, 1872, 1873, 1874, 1875, 1876 (two copies of 1876). Lowell.
- First (two copies) and Third Annual Reports of the Public Water Board of Lynn, Mass., for the years 1872 and 1874.
- First and Third Annual Reports of the Board of Water Commissioners of Manchester, N. H., for the years 1873 and 1874. Manchester.
- Louisville Water Company. Reports from 1861 to 1871 inclusive. Louisville.
- Newburgh Water Works. Annual Reports from 1867 to 1872 inclusive. Newburgh.
- Providence Water Works. Report of the Chief Engineer. January, 1871. Providence.
- Pawtucket Water Works. Fifth, Sixth and Seventh Quarterly Reports. June, September and December, 1878. Pawtucket, R. I.
- The Pawtucket Water Question. Large Meeting at Armory Hall. From the Providence Journal, Feb. 28, 1876.
- Providence Water Works. Blank Return Book.
- Saint Louis Water Works. Reports of the Board of Water Commissioners from 1867 to 1876 inclusive. St. Louis.
- Contracts and Specifications of St. Louis Water Works.
- Philadelphia. Annual Reports of the Chief Engineer of the Water Department for the years 1873, 1874 and 1875. Philadelphia.
- Salem City Documents for 1871-72, 1872-73, 1873-74. Salem, Mass.
- Proceedings had in Board of Supervisors and Reports of Engineer in the matter of furnishing Water Supplies for the City and County of San Francisco. San Francisco. 1875.
- Reports of the Board of Water Commissioners of the City of Springfield to the City Council for 1875 and 1876. Springfield, Mass.
- Third Annual Report of the Board of Water Commissioners of the City of Yonkers. Dec., 1875. New York. 1876.
- The Differentiating Waste Water Meter. Liverpool. G. F. Deacon, patentee.
- Report of the American Scientific Commission on the Artificial Water Ways of Europe, with special reference to the Tehuantepec Railway and Ship Canal. October 16, 1871. London.
- Borough of Liverpool. Waste Water Meter. Report of F. J. Bramwell, C. E. F. R. S. Liverpool. 1874.
- Town of Westborough. Report of a Committee chosen by the town, May 15, 1872, to make investigations with Reference to the Feasibility and Cost of Obtaining a Supply of Pure Water for said town. Providence. 1873.
- Reports of the Boston Harbor Commissioners. Vol. I and II, 1859 to 1865 inclusive. Boston.
- Petitions for damages for the Diversion of Sudbury River by the City of Boston. Boston. 1876.
- Report upon the Improvement of Roger Williams Park, by the Joint Committee on Parks, with Report of H. W. S. Cleveland. October, 1878. Providence, R. I. 1878. (2 copies.)
- Thirteenth Annual Report of the Brooklyn Park Commissioners. Brooklyn. 1873.
- Annual Report of the State Geologist of New Jersey for the year 1876. Trenton. 1876.
- Reports of the Board of Road Commissioners, City Surveyor and City Inspector of New Haven Conn. Year 1875. New Haven. 1876.
- Census of Rhode Island. June 1, 1875. Part II. Tables.
- An Address at the Dedication of Pardee Hall, Lafayette College, October, 1873, by R. W. Raymond, Ph. D. Easton, Pa. 1873.
- Mouth of the Mississippi. The Jetty System Explained. By James B. Eads. St. Louis. 1874.
- Report of the Commission of Engineers appointed to Investigate and Report a Permanent Plan for the Reclamation of the Alluvial Basin of the Mississippi River Subject to Inundation. Washington. 1875.
- Reports upon the Specimens obtained from Borings made in 1874, between the Mississippi River and Lake Borgne, at the site proposed for an outlet for flood waters, by Prof. E. W. Hilgard and Dr. F. V. Hopkins. Washington. 1878.
- Handbuch der Wasserbaukunst, von G. Hagen. Band I and II and Plates. Berlin. 1869 and 1870.

- The Haidah Indians of Queen Charlotte's Islands, B. C. with a brief description of their Carvings, Tattoo Designs, etc., by James G. Swan. Wash. City. 1874.
- Boston Water Reports. 2 volumes. Vol. 1, 1845 to 1861 inclusive. Vol. II, 1862 to 1871 inclusive.
- Boston. Reports of the Cochituate Water Board to the Council of Boston, for the years ending April 30, 1872, 1873, 1874, 1877, 1878.
- Communication from the Cochituate Water Board in regard to the High Service District, and a Report from the City Engineer on same subject.
- Sixth Annual Report of the Lowell Water Board, January 13, 1879. Lowell, Mass. 1879.
- Second Annual Report of the Lawrence Water Board. Lawrence. 1878.
- Borough of Liverpool Waste Water Meter, recently patented by the Engineer. Report of F. J. Bramwell, C. E. Liverpool. 1874.
- The Differentiating Waste Water Meter. (Deacon's Patent.) Liverpool.
- The Eighth, Ninth, Tenth and Eleventh Annual Report of the Mystic Water Board, for the years ending Dec. 31, 1872, 1873, and from Jan. 1, 1874 to April 30, 1875, also from May 1, 1875, to May 1, 1876.
- Salem Water Reports. 2 vols. Vol. I, from 1863 to 1867 inclusive. Vol. II, from 1868 to 1870.
- Water Reports. Charleston, Cambridge, Lowell and Philadelphia. 1867-1872.
- Specifications of the Charleston, Lowell, and New Bedford Water Works.
- Appareil et Construction des Ponts Biais, par M. Graeff. Text, Paris. 1867.
- Die Correction des Rheins von Basel bis zur Crosh. Heessischen Creutz. Denkschrift. 1862.
- Karten über die Binnenflüsse im Großherzogthum Baden nach dem Stande, vom Jahr. 1865.
- Karte über der Lauf des Rheins lange der Badisch-Französischen Grenze nach dem Stande der Jahre 1838 und 1861, und lange der Badisch-Bayerischen Grenze nach dem Stande der Jahre 1817 und 1861.
- Der Binnenfluss Bau im Großherzogthum Baden. Bearbeitet. 1865.
- Der Reefin und dessen technische Behandlung langs der Badisch-Französischen Grenze. Von Basel bis Lauterburg. Kallrube. 1855.
- Experiences Hydraulics. Vol. 1, Text Vol. II Atlas by Poncelet Lesbros.
- From John C. Trautwine, Philadelphia: A Book of Architecture containing designs of buildings and ornaments. James Gibbs. London. 1728.
- Wood's American Portfolio of original Philadelphia designs for Iron Railings, Verandahs, Statuary, Monuments, &c, Philadelphia. 1851.
- A Theoretical and Practical Treatise on the Construction of Bridges in Stone, Iron and Wood, &c. George Duggan. Parts I to VII. New York. 1850.
- Plans and Sections of the Obelisk on Bunker's Hill. S. Willard. Boston. 1843.
- A Description of Tremont House with Architectural Illustrations. Boston. 1830.
- Report of the Surveyor-General of Prisons on the Construction, Ventilation and details of Pentonville Prison, 1844. London. 1844.
- Description of Col. S. H. Long's Bridges, together with a series of directions to Bridge Builders. Stephen H. Long. Philadelphia. 1841.
- Illustrations of Pile Driving. London. 1787.
- Report of the Final Location and Probable Cost of the Cincinnati, Hillsburgh and Parkersburgh Railroad. Ellwood Morris. Cincinnati. 1863.
- Third Annual Report of Hiwassee Railroad, and Report of Chief Engineer. Athens, Tenn. 1839.
- Honduras Inter-oceanic Railway. Preliminary Report. E. G. Squier. New York. 1854.
- Honduras Inter-oceanic Railway, with Maps of the Line and Ports and Appendix. E. G. Squier. London. 1857. (2 copies.)
- Reports on Supplying Boston with Pure Water. By Loamm Baldwin, Esq. Boston. 1834, 1st Edition. 1835, 2d Edition.
- Proceedings before a joint Special Committee of the Massachusetts Legislature, upon the Petition of the City of Boston for leave to introduce a supply of Pure Water into that City from Long Pond. Boston. 1845.
- Public Works in the United States of America. Edited by William Strickland. Ed. H. Gill. Henry R. Campbell. Text and Atlas. London. 1851.
- Some Remarks on the Internal Improvement of the South. John C. Trautwine. Philadelphia. 1839.
- Remarks on the Canal or "Digue" of Carthagén, New Grenada, and its Navigation by Steam. New York. 1855.
- Reports upon Specimens obtained from Borings made in 1874, between the Mississippi River and Lake Borgne. Eugene W. Hilgard and Dr. F. V. Hopkins. Washington. 1878.
- Reports on the means of improving the present Harbor and the Construction of Docks at Montreal. Hon. John Young. Montreal. 1859.
- Translation of Notes Accompanying Drawings concerning the Construction of Iron Lock-Gates for the Harbors of the Weser River, Germany. Gen. G. Weitzel, U. S. A. Washington, D. C. 1873.
- Recreations in Mathematics and Natural Philosophy. Charles Hutton, L. L. D., F. R. S. In 4 volumes. London. 1803.
- Journal of the Expedition of Inquiry for the Junction of the Atlantic and Pacific Oceans. L. Gisborne. With 4 Maps. Philadelphia. 1854.
- On the connection of Geology with Terrestrial Magnetism. Evan Hopkins, C. E., F. T. G. S. London. 1844.
- Practical Tables in Meteorology and Hypsometry, with Appendix to the Paper on the use of the Barometer in Surveys, &c. B. S. Williamson. New York. 1863.
- Catalogue of Saw-Machines and Wood-Working Machinery. Vienna Exposition. 1873. Philadelphia Exposition. 1876.
- Northwest Territory. Reports on the Assiniboine and Saskatchewan Exploring Expedition. By Henry Y. Hind, M. A. Toronto. 1859.
- Recherches Experimentales sui les Claux de Construction les Bétons et les Mortiers ordinaires. L. J. Vicat. Paris. 1818.
- The Civil Engineer's Pocket Book, John C. Trautwine, C. E. Philadelphia. 1881.

## LIST OF MEMBERS.

## ADDITIONS.

## MEMBERS.

	Date of Election.
BUDGE, ENRIQUE.....Valparaiso, Chili.....	Feb. 1, 1882.
GORDON, ROBERT.....Henzada, British Burma.....	Feb. 1, 1882.
KINNEY, EDWARD C.....Chief Engineer St. Louis, Des Moines and Northern R. R., Des Moines, Iowa..	May 3, 1882.
LINDENTHAL, GUSTAV.. Civil Engineer Monongahela Bridge, Pittsburgh, Pa.....	May 3, 1882.
McCOLLOM, THOMAS C.. Civil Engineer U. S. N., New London, Ct.	May 3, 1882.
PERKINS, CHARLES P....(Elected Junior Feb. 3, 1875), Engineer P. & E. Div. P. R. R., and S. S. E. & C. Div. North Cent. Ry., Williams- port, Pa.....	April 5, 1882.
RANDOLPH, JAMES L....Chief Engineer Baltimore & Ohio R. R., Camden Station, Baltimore, Md. ....	Mch. 1, 1882.
REEVES, DAVID.....(Elected Junior April 1, 1874), Pres. Phoenix Iron Co., 410 Walnut Street, Philadelphia, Pa.....	May 3, 1882.
RHODES, BENJAMIN....Niagara Falls, N. Y.....	April 5, 1882.

## CHANGES AND CORRECTIONS.

## MEMBERS.

BECKWITH, ARTHUR.....	Tribune Building, Room 75, New York City, N. Y.
BECKWITH, LEONARD F..	Tribune Building, Room 75, New York City, N. Y.
BRECKINRIDGE, CABELL.	Chief Engineer Alabama Gt. Southern R. R. Tuska- loosa, Ala.
BUCK, L. L. ....	124 Bedford Avenue, Brooklyn, N. Y.
CHITTENDEN, S. H....	East River, Conn.
CORTHELL, E. L.....	Chief Engineer N. Y. W. S. & B. R. R., Mills Building, 15 Broad Street, New York City, N. Y.
CROSBY, WILSON.....	Room 145, Temple Court, 5 Beekman Street, New York City, N. Y.
DAVIS, JOSEPH P.....	144 Greenwich St., New York City, N. Y.
DURHAM, C. W.....	19 Fifth Avenue, New York City, N. Y.
GOLAY, PHILIP.....	U. S. Asst. Engineer, Paducah, Ky.
HARDING, HENRY.....	Salem, Mass.
HARRIS, ROBERT L....	Care Dr. David Kimball, Portsmouth, N. H.
HUGHES, WILLIAM M...	Engineer of Bridges, N. Y. C. & St. L. Ry., Hoyt Block, Cleveland, Ohio.



- KATTÉ, WALTER.....Chief Engineer N. Y., Ont. & W. Ry., and N. Y., W. S.  
and B. R. R., Mills Building, 15 Broad Street,  
New York City, N. Y.
- LOTZ, WILLIAM H.....57 Metropolitan Block, Chicago, Ill.
- MASTEN, C. S..... Div. Eng. W., St. L. & P. R. R., St. Louis, Mo.
- MAXWELL, JAMES R.....Chief Eng. and Supt. Cons. D. O. & O. R. Ry., Olney,  
Ill.
- MONROE, J. ALBERT....Div. Eng. N. Y., W. S. & B. R. R., Kingston, N. Y.
- MOORE, CHARLES E.....Asst. Eng. W., St. L. & P. R. R., St. Louis, Mo.
- MORRIS, MARSHALL.....Chief Eng. C. & I. Div. L. N. A. & C. Ry., 530 W.  
Walnut Street, Louisville, Ky.
- NICHOLS, O. F.....Res. Eng. Henderson Bridge Co., Henderson, Ky.
- PAINE, CHARLES.....Gen. Mang. N. Y., W. S. & B. R. R., Mills Building,  
15 Broad Street, New York City, N. Y.
- PICKETT, WILLIAM D...Fort Washakie, Wyoming.
- ROTOCH, WILLIAM.....Treasurer Connotton Valley Ry., 13 Exchange Street,  
Boston, Mass.
- SANDERSON, J. GARDNER.Tribune Building, Room 77, New York City, N. Y.
- SEARS, CLINTON B.....Capt. Corps of Engineers U. S. A., Executive Officer  
Mississippi River Com., 2828 Washington Avenue,  
St. Louis, Mo.
- SEYMOUR, HORATIO, JR..Marquette, Mich.
- TINTORER Y GIBERGA, JOSÉ.Asalto No. 12, Barcelona, Spain.
- WELLINGTON, ARTHUR M.Asst. Gen. Mang. Mexican Cent. R. R., No. 5 Plazuela  
de San Fernando, Mexico, Mex.
- WURTELE, A. S. C.....Asst. Eng. N. Y. C. & H. R. R. R., 60 Chestnut Street,  
Albany, N. Y.

## JUNIORS.

- EMONTS, WM. A. G.....Sunbury Northumberland County, Pa.
- HORTON, SANDFORD.....Peekskill, N. Y.
- LAFON, THOMAS.....Sub. Div. Eng. Mex. Nat. Cons. Co., Manzanilla,  
Mexico.
- LUCAS, D. JONES.....Lowellville, Mahoning Co., Ohio.

## DEATHS.

- BARNARD, JOHN G.....Elected Member Sept. 15, 1869; elected Honorary  
Member April 7, 1873; died April 14, 1892.

# List of Members.

MAY, 1882.

Additions and Corrections too late for insertion in bound copy.

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## ADDITIONS.

### MEMBERS.

Name.	Address.	Date of Membership.
BIXBY, WILLIAM H.	Lieut. Corps of Engineers, U. S. A. (care C. L. Bixby), 10 India st., Boston, Mass.	April 5, 1882
MCCOLLOM, THOMAS C.	Civil Engineer, U. S. N., New London, Conn.	May 3, 1882

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## CHANGES AND CORRECTIONS.

### MEMBERS.

Name.	Address.	Date of Membership.
BRECKINRIDGE, CABELL	Eng. Alabama Great Southern R. R., Tuscaloosa, Ala.	June 1, 1881
CROSBY, WILSON	Room 145, Temple Court, 5 Beekman st., New York City, N. Y.	Sept. 15, 1869
DAVIS, JOSEPH P.	144 Greenwich st., New York City, N. Y.	Jan. 29, 1868
GREENE, DAVID M.	41 First st., Troy, N. Y.	May 20, 1868
MOORE, CHARLES E.	Asst. Eng., W., St. L. & P. R. R., St. Louis, Mo.	Jan. 7, 1880
NOBLE, ALFRED	U. S. Asst. Eng., Sault Ste Marie, Mich.	{ J. Sept. 2, 1874 { M. April 3, 1878
PALMER, FRANCIS I.	Care G. I. Whitehead, 206 Broadway, New York City, N. Y.	Dec. 1, 1880
PICKETT, WILLIAM D.	Fort Washakie, Wyoming.	July 6, 1853

### JUNIORS.

Name.	Address.	Date of Membership.
EMONTS, WILLIAM A. G.	Sunbury, Northumberland Co., Pa.	Sept. 6, 1876
HAVILAND, ARTHUR	(Care Am. Soc. C. E.) 127 East 23d st., New York City, N. Y.	Jan. 4, 1882

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## DECEASED.

### HONORARY MEMBER.

BARNARD, JOHN G.

Died May 14th, 1882.



# American Society of Civil Engineers.

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## PROCEEDINGS.

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Vol. VIII.—June, 1882.

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### MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

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#### OF THE SOCIETY.

JUNE 7TH, 1882.—The Society met at 8 p. m. President Welch in the Chair. Ballots for membership were canvassed and the following candidates declared elected as Members: Thomas Doane, Charlestown, Mass.; Leon Joseph Fremaux, New Orleans, La.; Edmund Le Breton Gardiner, Passaic, N. J.; Edward Henry Keating, Halifax, N. S.; John Francis Le Baron, Jacksonville, Fla.; Augustus Woodbury Locke, North Adams, Mass.; Howard Schuyler, Mexico, Mexico; as Associates: Thomas Walter Nicol, Forlorn Hope, La.; Ashbel Welch, Jr., Lambertville, N. J.; as Juniors: John Ripley Freeman, Lawrence, Mass.; William Bronard Mackenzie, Moncton, N. B.; William Barclay Parsons, New York City, N. Y.; Alfred Rosenweig, Mexico, Mexico.

A paper by James Owen, Member A. S. C. E., subject, Highway Bridges, was read by the author and discussed by Messrs. Corthell, G. S. Greene, Jr. and Ashbel Welch.

#### OF THE BOARD OF DIRECTION.

MAY 3D, 1882.—Applications were considered. The purchase and receipt of the professional library of the late James P. Kirkwood was

reported. Arrangements were made for the annual Convention. Appropriations were made.

JUNE 6TH, 1882.—Applications were considered. Appropriations were made. It was determined that a meeting of the Society should be held on July 5th, and that thereafter the meetings should be suspended until the first Wednesday in September. A communication from the Committee on Standard Time was considered and action taken.

### CONTRIBUTIONS TO THE BUILDING FUND.

By a resolution of the Board of Direction, all contributions to the Building Fund are to be acknowledged, from time to time, by printing lists of the same in the monthly Proceedings of the Society, and in addition to this the names of all those who may subscribe \$100 or more are to be regularly enrolled and published in future lists of the Society under the head of Subscribers to the Building Fund, and they will be entitled to receive one copy of the monthly publications, comprising all papers and transactions of the Society, regularly, for life, for each \$100 subscribed by them ; such copies to be in addition to those which they may be already entitled to if they are Members or Fellows :

The following contributions are acknowledged in addition to the heretofore noted :

Robert Ballard.....	\$100 00
Charles R. Boyd.....	100 00

### ADDITIONS TO

### LIBRARY AND MUSEUM.

From Gen. Adna Anderson, St. Paul, Minn. :  
Military Railroads, 1861-67. General Orders, Instructions and Reports.

From James P. Bogart, New Haven, Conn. :  
Sixteenth Annual Report of the Fish Commissioners, and First Report of the State Shell Fish Commissioners. Hartford. 1881.

From Charles O. Brown, New York :  
A set of Maps of United States of Columbia.

From Francis Collingwood, New York :  
Specifications for Certain Steel Work required for the Completion of the Suspended Superstructure of the East River Bridge. 1881.

From J. James R. Croes, New York :  
Graphic History of Introduction of Water in Bridgeton, N. J. Dec. 24, 1877.

First, Second and Third Annual Reports of the Water Committee of Bridgeton, N. J., for the years 1878-79-80.

From James B. Eads, St. Louis :  
Letter of Sir Edward J. Reed, K. C. B., to Rear Admiral Ammen, U. S. N., on Ship Railways and Canals on the American Isthmus. (*Copies for distribution.*)

From W. W. Evans, New York :  
Letter of W. W. Evans, Civil Engineer, on Plan of Bulkheads and Docks for the City of New York. New York. 1881.

From G. Clinton Gardner, Greenfield, Mass. :

Answer to some of the Objections made against the Memorial of the Troy and Greenfield Railroad Company. Boston. 1857.

Value of the Stock and Bonds of the Troy and Greenfield Railroad. Greenfield. 1856.

- An Address to the Stockholders of the Troy and Greenfield Railroad Company. O. Clapp. Boston. 1855.
- Memorial of the Western Railroad Corporation. Boston. 1854.
- Speech of Hon. H. G. Parker, of Greenfield, in the Massachusetts House of Representatives. 1854.
- By-Laws and Acts of Incorporation of the Troy and Greenfield Railroad Company.
- A brief Report of the Hoosac Tunnel. Boston. 1864.
- Reasons Why Boston should Aid in the Construction of the Hoosac Tunnel. Boston. 1860.
- Report on the Memorial of the Troy and Greenfield Railroad Company. Boston. 1861.
- Report of the Committee of Investigation on the Hoosac Tunnel Loan. Greenfield. 1860.
- General Laws and Resolves passed by the Legislature of Massachusetts during the Sessions of 1867 and 1869.
- Final Settlement of the Claim of H. Haupt & Co. against the State of Massachusetts. H. Haupt. Boston. 1869.
- Report of the Treasurer and Receiver-General of the Commonwealth of Massachusetts. Boston. 1863.
- Report of the Troy and Greenfield Railroad and Hoosac Tunnel. B. H. Latrobe. Boston. 1869.
- Valedictory Address of Alexander H. Bullock, to the Legislature of Massachusetts. Boston. 1866. 1869.
- Truths about the Hoosac Tunnel Projects. Boston. 1851.
- Cost of the Tunnel of the Troy and Greenfield Railroad.
- Closing Argument of H. Haupt in behalf of the Troy and Greenfield Railroad Company. Boston. 1862.
- The Hoosac Tunnel and the Troy and Greenfield Railroad. 1862.
- The Decline and Fall of the Hoosac Tunnel. F. W. Bird. Boston. 1862.
- Report Relative to Conveyances of the Southern Vermont Railroad. 1862.
- Speech of Hon. Whiting Griswold on the Bill Concerning the Troy and Greenfield Railroad. Boston. 1862.
- The Condition and Prospects of the Hoosac Tunnel. F. W. Bird. Boston. 1865.
- Report of the Troy and Greenfield Railroad. Boston. 1865, 1867, 1869.
- Statement of H. Haupt to the Joint Special Committee on Troy and Greenfield Railroad and Hoosac Tunnel. 1864.
- Argument of Hon. D. S. Richardson on the Troy and Greenfield Railroad. Boston. 1863.
- Report of the Arguments on the subject of the Troy and Greenfield Railroad and Hoosac Tunnel. Boston. 1863.
- Speech of Wm. D. Swan concerning the Troy and Greenfield Railroad. Boston. 1862.
- Report of the Commissioners of the Troy and Greenfield Railroad and Hoosac Tunnel. Boston. 1869.
- Report of the Water Commissioners of the City of Lawrence. Lawrence, Mass. 1871, 1872, 1873, 1875, 1876.
- Rejected papers in relation to the Hoosac Tunnel. Boston. 1868.
- Report of the Hon. A. Crocker upon the Work of the Troy and Greenfield Railroad and Hoosac Tunnel. Boston. 1868.
- Report of the Commissioners of the Department of Parks of Boston. Boston. 1876.
- Boston in the Future. Its Park Grounds and a Grand Avenue. Boston. 1871.
- Proceedings of a Public Meeting held at Faneuil Hall, Boston. Boston. 1876.
- Report of the Water Commissioners of Brooklyn. Brooklyn. 1879.
- Annual Report of the City Engineer of Boston. Boston. 1878 and 1879.
- Map and Description of the proposed Metropolitan Park for Boston. Boston. 1870.
- Essay and Plan for the Improvement of Boston. R. M. Copeland. Boston. 1872.
- Facts and Figures concerning the Hoosac Tunnel. J. J. Piper. Fitchburg. 1866.
- The Hoosac Tunnel Route compared with the Western Railroad. A. B. Field. Lowell, Mass. 1866.
- Annual Report of the Cochituate Water Board. Boston. 1861 to 1864 and 1867.
- Lawrence Water Works :
- Contract and Specifications for a Distributing Reservoir. 1873. (2 copies.)
- Contract and Specifications for Furnishing Stone. 1874. (2 copies.)
- Contract and Specifications for Laying Water Pipe. 1874. (2 copies.)
- Contract and Specifications for Furnishing Water Pipes and Special Castings. 1874, (2 copies.)
- Appleton's Mechanics' Magazine and Engineering Journal. Nos. 1 to 9, inclusive.
- The Practical Mechanic's Journal. Part XVIII. September, 1849.
- Acts Granting Aid to the Troy and Greenfield Railroad, that a committee of five be appointed to inquire what payments have been fully complied with. January 30, 1860.
- Report of the Committee on Hoosac Tunnel, Troy and Greenfield Railroad. March 20, 1879.
- An Act Authorizing a Loan of the State Credit to enable the Troy and Greenfield Railroad Company to Construct the Hoosac Tunnel.
- The Legislature of 1868 authorizing the Governor and Council to make a Contract for the Completion of the Hoosac Tunnel.
- Statements of Payments on account of the Troy and Greenfield Railroad and Hoosac Tunnel.
- Report of Joint Special Committee on the Troy and Greenfield Railroad and Hoosac Tunnel, to whom was referred so much of the Governor's address as relates to that subject. April 17, 1865.
- Report of Messrs. J. W. Brooks, Samuel M. Felton and Alex. Holmes, Commissioners appointed under chapter 156 of the Acts of 1862, providing for the more speedy completion of the Troy and Greenfield Railroad and Hoosac Tunnel. January 14, 1865.
- Report to the House what amount of money has been paid on account of the Hoosac Tunnel during last year. February 1, 1864.
- Report of the Committee on Finance, to whom was referred the bill to incorporate the Boston and Northwestern Railroad Company. May 5, 1873.
- An Act to provide for the Consolidation of the Hoosac Tunnel line of railroads from Boston to Troy. April 23, 1873.
- Report of the Committee on the Troy and Greenfield Railroad and Hoosac Tunnel who were ordered to inquire into the cause of the disaster involving the loss of so much life and property. May 19, 1868.

- Report of the Committee of the Troy and Greenfield Railroad to whom was referred the memorial of Herman Haupt & Co. April 30, 1868.
- Report of the Committee on Finance to provide for funding the unfunded debt created in the construction of the Troy and Greenfield Railroad Company and the Hoosac Tunnel.
- Reply to the communication of J. W. Brooks on a surface railroad over the Hoosac Mountain. May 7, 1866.
- Report of the Committee on the Hoosac Tunnel, Troy and Greenfield Railroad to whom was referred the memorial of Herman Haupt. April 2, 1866.
- Report on the Troy and Greenfield Railroad and Hoosac Tunnel by the Joint Special Committee of 1865. Boston, 1866.
- Report of the Committee on the Treasury to whom was referred the House Resolve appropriating the sum of \$53 000 00 to H. Haupt & Co. June 4, 1868.
- An act authorizing a Loan of the State Credit to enable the Troy and Greenfield Railroad to construct the Hoosac Tunnel. February 18, 1859.
- Report of the Joint Standing Committee on Railways and Canals to whom was referred the petition of the Troy and Greenfield Railroad Company. February 11, 1859.
- Address of Nathaniel P. Banks to the Legislature of Massachusetts. Boston. 1859.
- Third Annual Report of the Troy and Greenfield Railroad Company.
- Report of the Work upon the Troy and Greenfield Railroad and Hoosac Tunnel. Hon. A. Crocker. Boston. 1866. (2 copies.)
- An act in further addition to an act providing for the more speedy completion of the Troy and Greenfield Railroad and Hoosac Tunnel. April 17, 1867.
- Commissioners' report on the speedy completion of the Troy and Greenfield Railroad and Hoosac Tunnel. January 10, 1866.
- An act authorizing a loan of the State Credit to enable the Troy and Greenfield Railroad Company to construct the Hoosac Tunnel. March 5, 1859.
- Report of the Joint Special Committee to whom was referred the petition of the Troy and Greenfield Railroad Company. April 12, 1856.
- Petition of the Troy and Greenfield Railroad. April, 1854.
- An act authorizing the City of Boston to subscribe to the Capital Stock of the Troy and Greenfield Railroad Company.
- Report of the Special Committee relating to payments made to the Troy and Greenfield Railroad Company under several acts granting State aid to said company.
- Memorial to the Senate and House of Representatives of the State of Massachusetts.
- Report of the Joint Special Committee to whom was referred so much of the Governor's address as relates to the Troy and Greenfield Railroad. April 4, 1863.
- Report of the Commissioners of the Troy and Greenfield Railroad relative to the progress and condition of the work.
- Report of Committee on Finance to whom was referred the resolve in favor of Herman Haupt & Co.
- Message of the Governor to the House of Representatives of Massachusetts, relating to an act authorizing a loan of the State Credit to enable the Troy and Greenfield Railroad to construct the Hoosac Tunnel. May 26, 1857.
- Report of the Committee on Finance to whom was referred the Bill to permit the establishment of a Union Freight Depot at Greenfield. May 10, 1878.
- General statement of the Summary of the Financial Transactions of the year (1868), from the report of the Auditor. Boston. January 15, 1869.
- Report of the Joint Standing Committee of 1867 on the Hoosac Tunnel and the Troy and Greenfield Railroad Company.
- An act to authorize the Governor and Council to expend a sum not exceeding \$300 000 00 for constructing archways in the Hoosac Tunnel, and for other purposes. 1874.
- Address of John A. Andrew to the Legislature of Massachusetts. Boston. 1864.
- From Wm. Paul Gerhard, Newport, R. I.:  
Diagrams for Sewer Calculations. Wm. Paul Gerhard. New York. 1881.
- From James H. Harlow, Pittsburgh:  
Forty-second Annual Report of Monongahela Navigation Co. Jan. 12, 1882.
- From B. Hering, Philadelphia:  
Report of the results of an examination made in 1880 of several sewerage works in Europe. R. Hering.
- From Keystone Bridge Co., Pittsburgh:  
Album of Structures built by the Keystone Bridge Co.
- From Wm. J. McAlpine, New York:  
A Treatise on Practical Surveying. Robert Gibson. Philadelphia. 1803.
- From Isaac Newton, Chief Engineer Department Public Works, New York:  
Report on Water Supply for City of New York. (Copies for distribution.)
- From M. E. Pontzen, Paris, France:  
Notice descriptive des Appareils Electriques Exposés par la Compagnie du Chemin de fer du Nord.
- From J. Harsen Rhodes, New York:  
A Treatise on the Calculus of Variations. Lewis Buffet Call, A. M. New York. 1881.
- From A. A. Robinson, Topeka, Kansas:  
Annual Report of the Board of Directors of Atchison, Topeka and Santa Fe Railroad, year ending Dec. 31, 1880.
- From T. Guilford Smith, Buffalo, N. Y.:  
Eighth, Ninth, Tenth and Eleventh Reports of the Buffalo Park Commission. August, 1881.
- From N. J. Welton, Waterbury, Conn.:  
Annual Report of Treasurer and Auditor, and Fifth Annual Report of the Water Commissioners of the City of Waterbury, year ending January 6, 1873.
- From George P. Wescott, Portland, Me.:  
Report Rates, Rules and Regulation, with a Sketch of the History of the Portland Water Co. Portland. 1881.
- From Thomas J. Whitman, St. Louis.  
Annual Report of the Board of Public Improvement. St. Louis. 1881.
- From Gen. H. G. Wright, Chief of Engineers, Washington:  
Reports as to additional works that are required to properly complete the improvement of the Saint Mary's River and Saint Mary's Falls Canal, Michigan, with an estimate of the cost of the same.
- Annual Report of the Joint Commission for the completion of the Washington Monument. 1881.

Report of Captain William Ludlow, Corps of Engineers upon an examination of Frankford Creek, from its mouth in the Delaware River to Frankford Avenue.

Reports of Capt. C. J. Allen, Corps of Engineers upon examinations of Beaver Bay, Grand Portage Bay, and Waus-wau-goning Bay. Minnesota.

Report of a practical resurvey of the Susquehanna River, near Havre de Grace, Md., and containing an estimate for the continuation of the improvement in that locality. 1882.

Report of Lieut.-Col. G. K. Warren upon a survey of Egartown Harbor and South Beach, Mass. 1882.

Report of Col. John Newton, with accompanying map, upon the completion of the Survey of Harlem River, New York, and through Harlem Kills to the East River, New York. 1881.

Report of Lieut.-Col. Q. A. Gillmore upon a survey made for the further improvement necessary in Savannah River and Harbor. 1882.

Report of Capt. O. H. Ernst upon a survey of Bish Bend in the Mississippi River, near Fort Chartres. 1882.

Reports of Maj. J. W. Barlow upon surveys made of Harbor of Madison, Connecticut; Harbor of Clinton, Connecticut; Greenpoint Harbor, N. Y.; Harbor of Mamaroneck, N. Y., for a breakwater and harbor of refuge at Milford, Conn. 1882.

Report upon the dredging of an ice harbor at Dubuque, Iowa. 1882.

Report of Capt. Thomas Turtle of surveys across the Peninsula of Maryland and Delaware, to connect by canal the waters of the Delaware and Chesapeake Bays. 1882.

Report of Lieut.-Col. G. K. Warren upon examinations and surveys of Buzzard's and Barnstable Bays, Mass. 1882.

Information in relation to the Government, Works on the Fox and Wisconsin Rivers improvement at Menasha and Appleton, Wis.

Report of Maj. J. W. Cuyler upon an examination of Licking River, from its mouth to Falmouth, Ky.

Estimates of amounts required to supply deficiencies in the appropriations for buildings and grounds in this City for the current fiscal year.

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## LIST OF MEMBERS.

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### ADDITIONS.

#### MEMBERS.

Date of Election.

BIXBY, WILLIAM H. ....	Lieut. of Engineers, U. S. A. (Care C. L. Bixby), 10 India St., Boston, Mass. ....	April 5, 1882.
CURTIS, WILLIAM G. ....	Supt. of Track, Central Pacific R.R., San Francisco, Cal. ....	May 3, 1882.
DOANE, THOMAS. ....	Consulting Engineer, Charlestown, Mass. ....	June 7, 1882.
GARDINER, EDMUND L. B. ....	Engineer Dundee Water Power and Land Co., Passaic, N. J. ....	June 7, 1882.
KEATING, EDWARD H. ....	City Engineer, Halifax, N. S. ....	June 7, 1882.

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#### ASSOCIATE.

WELCH, ASHBEL, JR. ....	Prop'r Lambertville Iron Works, Lambertville, N. J. ....	June 7, 1882.
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#### JUNIOR.

FREEMAN, JOHN R. ....	Prin. Ass't Engineer Essex Water Power Co., Lawrence, Mass. ....	June 7, 1882.
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## CHANGES AND CORRECTIONS.

## MEMBERS.

- ROSBY, WILSON.....115 Broadway, Room 141, New York City, N. Y.  
 AVIS, CHESTER B... ..Superintendent Water Works, Madison, Wis.  
 OVETT, THOMAS D....Consulting Engineer, 49 West Third Street, Cincinnati, Ohio.  
 ALMER, FRANCIS I.....(Care G. I. Whitehead), 206 Broadway, New York City, N. Y.  
 ARKHURST, HENRY W..Care S. C. & P. R.R., Missouri Valley, Iowa.  
 SCHMIDT, MAX E.....5 Congress Street, Chicago, Ill.
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## JUNIOR.

- AVILAND, ARTHUR.....(Care Am. Soc. C. E.), 127 East Twenty-third Street,  
 New York City, N. Y.

# American Society of Civil Engineers.

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## PROCEEDINGS.

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Vol. VIII.—July, 1882.

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### MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

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#### OF THE SOCIETY.

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JUNE 21ST, 1882.—The Society met at 8 P. M., President WELCH in the chair. A paper by O. Chanute, Member A. S. C. E., subject: Uniformity in Rolling Stock, was read by the Secretary, and discussed by Messrs. Compton, Cooper, Emery, Forney, William H. Paine and Welch.

JULY 5TH, 1882.—The Society met at 8 P. M., President WELCH in the chair. Ballots for membership were canvassed and the following candidates declared elected: as Members—Peter C. Asserson, Norfolk, Va.; Edward Cook Burns, Detroit, Mich.; David Dexter Clark, New Tacoma, Washington Ter.; William Hooper Dennis, Washington, D. C.; William Ludlow, Corps of Engineers, U. S. A.; M. William Mansfield, Zanesville, Ohio; William Abbott Pratt, Connellsville, Pa.; Nathaniel Chapin Ray, Sugar Loaf, Colorado; William Starke Rosecrans, San Francisco, Cal.; William Harrison Smith, Oneida, N. Y.; as Junior—Frederic Nicholas Blanc, New York, N. Y.

The death was announced of Ira E. Clark, Junior Member of the Society; elected February 6, 1878, Died May 23, 1882.

The Secretary announced that the act recently passed by Congress making appropriations for the Support of the Army, approved June 30, 1882, contained the following clause: "United States Testing Machine.—For caring for, preserving, using and operating the United States testing machine at the Watertown Arsenal, ten thousand dollars; *Provided*, That the tests of iron and steel, and other materials for indus-

trial purposes, shall be continued during the next fiscal year, and report thereof shall be made to Congress; *And provided further*, That in making tests for private citizens, the officer in charge may require payment in advance, and may use the funds so received in making such private tests, making full report thereof to the Chief of Ordnance; and the Chief of Ordnance shall give attention to such programme of tests as may be submitted by the American Society of Civil Engineers, and the record of such tests shall be furnished said society to be by them published at their own expense."

A paper by S. S. Haight, Member A. S. C. E., subject: Accuracy of Measurement as Increased by Repetition, was read by the author and discussed.

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#### OF THE BOARD OF DIRECTION.

JUNE 23D, 1882.—An Ordinance passed by the Councils and approved by the Mayor of the City of Philadelphia was considered. This Ordinance requests the American Society of Civil Engineers, conjointly with the Franklin Institute, to nominate to the Mayor of Philadelphia the names of nine Engineers. From these the Mayor is requested to select three to act, in conjunction with the Chief Engineer of the Water Department, as a Board of Experts in reference to the water supply of that city.

The Secretary was requested to confer with the officers of the Franklin Institute on this subject.

JULY 6TH, 1882.—Applications were considered. The Secretary reported an interview with the President of the Franklin Institute in reference to the ordinance of the Councils of the city of Philadelphia requesting the nomination of Engineers.

The Secretary was directed to ask, by circular letter, the opinion of the Members of the Society whether it would be expedient and advisable that the Board of Direction of the American Society of Civil Engineers should comply with requests to nominate Engineers from whom may be selected members of advisory professional boards. The Secretary was requested to accompany the circular letter with a statement of suggestions on each side of this question.

The Secretary presented a copy of the clause from the Army Appropriation Bill referring to this Society. [See Minutes of Society, July 5, 1882, above.] The President and Secretary were requested to invite, by correspondence, suggestions as to the method of preparing such programme of tests.

## CONTRIBUTIONS TO THE BUILDING FUND.

By a resolution of the Board of Direction, all contributions to the Building Fund are to be acknowledged, from time to time, by printing lists of the same in the monthly Proceedings of the Society, and in addition to this the names of all those who may subscribe \$100 or more are to be regularly enrolled and published in future lists of the Society under the head of Subscribers to the Building Fund, and they will be entitled to receive one copy of the monthly publications, comprising all papers and transactions of the Society, regularly, for life, for each \$100 subscribed by them; such copies to be in addition to those which they may be already entitled to if they are Members or Fellows:

The following contributions are acknowledged in addition to those heretofore noted:

R. S. Hayes ..... \$100 00

## MEMOIRS OF DECEASED MEMBERS.

**CHRISTIAN PHILIPP MAX MARIA, BARON VON WEBER, Hon.  
Member A. S. C. E.**

DIED APRIL 18TH, 1881.

Baron von Weber, the only son of the great composer, was born in Dresden in 1822. After a classical training he was educated specially for the profession of Engineering at the Polytechnic School in Dresden. He was directly afterwards connected, first as pupil and then as constructor, with the locomotive works of A. Borsig, in Berlin, and during that time attended the lecture courses on political economy and natural science, at the Berlin University. He then entered into practical service as a Civil and Mechanical Engineer upon the German railroads, serving in successively important capacities from that of a Locomotive Engineer up to that of General Manager. Subsequently he traveled professionally over the greater part of Europe, spending some time in England with Mr. Brunel and Mr. Stephenson. He also visited Northern Africa, at the request of the French Government, and wrote two books giving his observations upon that country. Returning to Germany, he was put in charge of the Erz Mountain Railroad. In 1850, he became Manager of State Telegraphs of the Saxon Government, and in 1852 became a member of the Royal Directory of Saxon Railroads with the title of Financial Councillor. In 1868, with a change of Administration, he left the Saxon service and accepted the appointment, at

NOTE.—The larger portion of the facts for the preparation of this memoir come from an article in the *German Railroad Union*. J. B., Editor.

Vienna, of Chief Consulting Engineer to the Austrian Ministry of Public Works, with the high rank of Imperial Councillor. He was entrusted with the preparation of a plan for the entire reorganization of the railways of Austria, and entered upon this work with zeal as peculiarly consonant with his desires. The retirement of the ministry and the occurrence of a financial crisis prevented the realization of these plans. He was not in entire accord with the subsequent ministry and in 1875 resigned his position. While in active supervision of the Austrian railways he studied technical questions arising in other countries, traveled over the railways of Northern Europe and reported on the question of the proper gauge to be adopted in Norway and Sweden. He also, during this period, inspected the railways of European and Asiatic Turkey.

His residence at Vienna, during several years after his resignation, gave opportunity for the exercise of his literary ability and his writings, particularly upon continental railway subjects, were frequent and of great interest.

In 1877, the Minister of Trade of the German Empire, Dr. Achenbach, appointed Baron von Weber, to the position of Consulting Engineer, with the understanding that he was to take the direction of a ministerial railway journal. The latter part of this project was not carried out, owing to the retirement of Dr. Achenbach from the Ministry directly afterwards, but von Weber was continued in his position with the Ministry of Trade and afterwards with the Ministry of Public Works, and was particularly commissioned to make official visits to and thorough studies of the railways and canals in Sweden, England, France and the United States of America.

In 1880 Baron von Weber came to America and traveled over the United States, extending his visit as far as New Orleans, St. Louis, Denver and Chicago. He was cordially welcomed by the Members of this Society and by all who had the pleasure of meeting him. His remarkable store of information on technical subjects was at once apparent, and his strong and positive ideas, often at variance with those held by American Engineers, led to many interesting conferences. Socially, he was most agreeable, and during the few months spent in this country formed friendships which have been very sadly broken by his unexpected decease.

The literary activity of Baron von Weber was remarkable. He treated in books, pamphlets and in contributions to journals, all the questions arising from time to time in the construction and operation of railways. His sketches or railway novels were of the greatest interest and influence, and entirely different from any previous treatment of such subjects. His large works, and particularly the *School of the Railroad*, and his *Experiments on the Stability of Construction of Track*, have become standard authorities. In the biography of his father, and in other

writings, he showed additional artistic and versatile ability. His place in Germany, particularly as an exponent and promoter of technical progress will not soon be filled. His death, at the early age of 59, while still in the vigor of apparent health, and with projects formed for the preparation of several great works, is a positive loss to engineering and to the civilized world.

Baron von Weber died at Berlin, April 18, 1881, very suddenly of heart disease. He had that morning finished his official report to the Ministry of Public Works upon the railways and canals of the United States. He was a member of many of the learned and scientific societies of the world, and a commander and knight of high orders. He was made an Honorary Member of the American Society of Civil Engineers, June 2, 1880.

### FRANCIS LAURENS VINTON, Member A. S. C. E.,

DIED OCTOBER 6TH, 1879.

Francis L. Vinton was born in 1832, his father being a distinguished officer of the United States Army. He graduated from the United States Military Academy at West Point in 1856. Resigning his commission soon afterwards, he prosecuted his studies for a number of years at the *Ecole des Mines* in Paris. He returned to the United States in 1860, and after a short time spent in giving instruction in the schools of the Cooper Union he went to Central America as engineer in charge of an exploration of the mineral resources of Honduras. At the beginning of the war of the rebellion, he returned to the United States, and was, on August 5th, 1861, commissioned as Captain in the Sixteenth United States Infantry. Directly afterwards he became Colonel of the Forty-third New York Volunteers, a regiment which gained special distinction under his command. Colonel Vinton was made Brigadier-General in March, 1862, and was given command of a brigade. He was severely wounded at the battle of Fredericksburg, and being disabled for active duty soon after resigned from the army.

In 1864, General Vinton became a professor in the School of Mines of Columbia College, and continued in that position until 1877, when he established himself as a Mining and Consulting Engineer in Colorado, with office at the City of Denver. He died quite suddenly at Leadville, at the date mentioned above.

General Vinton was an engineer of large theoretical acquirements, and his long service as an instructor had prepared him fully for the practical work upon which he had entered so shortly before his decease. Personally he was peculiarly attractive and genial, an excellent musician, an accomplished mathematician, and had fine artistic tastes and abilities.

He became a Member of the American Society of Civil Engineers August 5th, 1868. \*

**NORMAN A. WILLIAMS, Member A. S. C. E.,**

DIED OCTOBER 12TH, 1879.

Norman A. Williams was born at Oriskany, New York, August 21st, 1837. He entered the Rensselaer Polytechnic Institute in 1856, graduating in 1859. During his connection with the institute Mr. Williams obtained very high class standing, and was particularly proficient in topographical draughting. Some work of this nature done by him subsequently for the Croton Water Department of New York is remarkably fine.

After graduating, Mr. Williams was engaged for four years as an assistant engineer upon the Brooklyn Water Works. He then entered the engineering service of the Croton Aqueduct Department of New York City. His work in these positions was accurate and conscientious, and he deeply regretted that his health prevented him from continuing the exercise of his chosen profession. This, however, was the fact, and therefore in 1864 he returned to Oneida County, becoming associated in business with his brother in the firm of J. H. & N. A. Williams, where he remained until his death. Mr. Williams was a man of modest and quiet demeanor, of marked ability and of admirable character both in principle and conduct, and was particularly known and appreciated as such in the city of his residence. He became a Member of the American Society of Civil Engineers, February 17th, 1869.

**IRA EDGAR CLARK, Junior Member A. S. C. E.,**

DIED MAY 23D, 1882.

Ira E. Clark\* was born at Weston, Mass., October 18th, 1852. Educated at the district and high schools of his native town, he entered Cornell University in 1868, and graduated with the degree of Bachelor of Civil Engineering in 1872, at the age of twenty.

He was, directly after his graduation, appointed to a position in the office of the City Engineer of Cambridge, Mass., in which he continued for seven years, acquiring a valuable experience in the progress of the water works, the sewerage, and the miscellaneous engineering work of that city. In 1878 he was in Europe, visiting the principal cities, and attending the great exhibition in Paris, where he gave particular study to questions of water supply and sewerage.

In 1879, his health failing, he went to California and became interested in the construction of sub-irrigation works in the vicinity of San José. Here he remained until May, 1882, when he started for the State of Oregon, purposing to engage in railroad engineering. Arriving at

\* Memoir prepared by Wm. S. Barbour, Member A. S. C. E., and the Secretary.

San Francisco he was prostrated by a hemorrhage of the lungs, which terminated his life on the 23d of May.

Mr. Clark was a man of quick perception, grasping and overcoming difficulties with great readiness. He was much devoted to his profession of civil engineering, in which there was every promise of eminence for him. He was of aimable character and greatly loved by many friends. He became a Junior Member of the American Society of Civil Engineers February 6th, 1878.

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ADDITIONS TO

LIBRARY AND MUSEUM.

- From Charles A. Allen, Worcester, Mass. :  
Hearings before the Joint Standing Committee on Public Health, on the matter of restraining the City of Worcester from polluting Blackstone River. February and March, 1882.
- Address of the Mayor, with the Annual Reports of the several Departments of the City of Worcester, year ending November 30, 1881.
- From James P. Allen, Charleston, S. C. :  
Municipal Report on Artesian Wells. Charleston, S. C.
- From American Institute of Mining Engineers, T. M. Drown, Secretary, Easton, Pa. :  
Transactions. Vol. IX.
- From American Society of Mechanical Engineers, Thomas Whiteside Rae, Secretary, New York :  
Transactions. Vol. I.
- From Thomas S. Anderson, San Antonio, Texas. :  
Financial Statement and Transactions and Exhibit of Levee Work of the Board of Mississippi Levee Commission.
- From George D. Ansley, Montreal :  
Annual Report of the City Surveyor of Montreal for 1881.
- Report on Permanent Roadway Pavements for the City of Montreal. March 21, 1882.
- From William S. Barbour, Cambridge, Mass. :  
Cambridge City Documents. 1882.
- Annual Report, City Engineer of Cambridge, for 1881.
- Annual Report of Cambridge Water Board, for 1881.
- From Jacob Blickensderfer, Omaha, Neb. :  
Report of the Chief Engineer, Atlantic and Pacific Railroad.
- From William H. Bradley, Boston. :  
Annual Report on Sewerage of Boston, for 1881.
- From H. Wadsworth Clarke, Syracuse, N. Y. :  
Journal of the Board of Supervisors, of the County of Onondaga, N. Y., for 1881.
- From Martin Coryell, Lambertville, N. J. :  
Fifth Annual Meeting and Report of the Lambertville Water Co.
- From Joseph P. Davis, New York :  
Fourth and Fifth Annual Reports of the Boston Water Board. (3 copies.)  
The Worcester Sewerage and the Blackstone River. (3 copies.)
- From George W. Dresser, New York :  
Improved District Railway Map of London. 1880.
- From A. J. Du Bois, New Haven :  
A new Theory of the Suspension System with Stiffening Truss. A. J. Du Bois.
- From James B. Eads, St. Louis :  
Minority Report of Mississippi River Commission. (*Copies for distribution.*)
- From Henry Faija, London, England :  
Portland Cement for Users. Henry Faija, C. E. London. 1881.
- From F. U. Farquhar, Detroit, Mich. :  
Report upon the Construction of the Tillamook Rock Light House. Maj. G. L. Gillespie. Washington. 1881. (5 copies.)
- From Albert Fink, New York :  
Report on the Adjustment of Railroad Transportation rates to the Seaboard. Albert Fink. New York. 1882.
- Argument before the Committee on Commerce, U. S. House of Representatives. Albert Fink. March 17th and 18th, 1882.
- From Charles E. Fowler, New Haven :  
Contract between the City of New Haven and New Haven Water Company.
- Annual Reports of the Street Department of New Haven, for 1881. (2 copies.)  
City Year Book of New Haven. 1881.
- From James B. Francis, Lowell, Mass. :  
Ninth Annual Report of the Lowell Water Board.
- From James T. Gardiner, Albany, N. Y. :  
Report on Methods of Sewerage for Cities and large Villages in the State of New York. (6 copies.)



- From Wm. Paul Gerhard, Newport, R. I. :
- House Drainage and Sanitary Plumbing. Wm. Paul Gerhard, C. E.
- From Charles O. Gleim, Cologne, Germany :
- Denkschrift über die Kosten Binnenschiffahrt, From Robert Gordon, Henzada, British Burmah :
- Report on the Administration of British Burmah. 1880-'81.
- From Lt. Com. H. H. Gorringer, New York :
- Egyptian Obelisks. H. H. Gorringer. New York. 1882.
- From B. M. Harrod, New Orleans :
- Note sur les divers moyens employés pour améliorer les conditions de navigabilité des rivières. M. S. Janicki. Paris. 1880.
- Seconde note sur les moyens employés pour améliorer les conditions de navigabilité des rivières. M. S. Janicki. Paris. 1880.
- From James H. Harlow, Pittsburgh :
- Forty-second Annual Report of the Monongahela Navigation Co.
- From Clemens Herschel, Holyoke, Mass. :
- Report of Committee appointed in relation to the Commonwealth Flats near South Boston. Boston. 1868.
- From John Houston, La Guira, Venezuela :
- Plano del Ferro carril del ajo de Agua à Caracas.
- From Institution of Civil Engineers, James Forrest, Secretary, London :
- Minutes of Proceedings. Vols. I to XX, inclusive.
- Index to Vols. I to XX.
- Transactions. Vol. III. 4to.
- From Institution Engineers and Shipbuilders, Glasgow, Scotland :
- Transactions. Vol. XXIV. 24th Session. 1880-81.
- From Hon. David H. Jerome, Governor of Michigan. Lansing :
- Annual Report of the Commissioner of Mineral Statistics for 1880.
- From John B. Jervis, Rome, N. Y. :
- Report on New York City Water Supply. John B. Jervis, C. E.
- From H. Kato, University of Tokio, Japan :
- Calendar of the Department of Law, Science, and Literature.
- Geology of the Environs of Tokio.
- Measurements of the Force of Gravity at Tokio and on the summit of Fujinoyama.
- From John Kennedy, Montreal :
- Annual Report of the Harbor Commissioners of Montreal, for 1881. (2 copies.)
- From William Kingsford, New York :
- The Canadian Canals. History, Cost, &c. Wm. Kingsford, C. E.
- From John H. B. Latrobe, Baltimore, Md. :
- The Capitol and Washington at the beginning of the present Century.
- From Louis Lesage, Montreal :
- Annual Reports of the City of Montreal, from 1872 to 1881, inclusive.
- From Albert Levy, New York :
- Photograph of the East River Bridge.
- Lithograph of Isthmus Canal at Panama.
- From Charles L. McAlpine, New York :
- Annual Report of the Secretary of Internal Affairs of the State of Pennsylvania. Harrisburg. 1880.
- Annual Report of the State Engineer and Surveyor on the Railroads of the State of New York. Albany. 1881.
- Reports on the Grand Water Ways of Pennsylvania, for 1878, 1879 and 1880.
- Report of the Pennsylvania Board, on the Northern and Western Boundary. Harrisburg. 1881.
- From Colonel Wm. E. Merrill, U. S. A. Cincinnati :
- Seven Photographs of Davis Island Dam.
- From Gilbert Murdoch, St. John, N. B. :
- Report on the Meteorological Service of the Dominion of Canada.
- Special Report on Water Supply of St. John and Portland. (2 Copies.)
- From Prof. Wm. Ripley Nichols, Boston :
- Natural Filtration at Berlin. Wm. Ripley Nichols.
- Remarks on Tastes and Odors of Surface Water. Wm. Ripley Nichols.
- Sand Filtration. Wm. Ripley Nichols.
- On the Temperature of Fresh Water Lakes and Ponds. Wm. Ripley Nichols.
- From George B. Nicholson, New Orleans, La. :
- Mineral and Agricultural Resources of the Portion of Tennessee along the C., S. and K. and O. R. R.
- From Joseph Nimmo, Jr., Chief of Bureau of Statistics, Washington :
- Annual Report on the Commerce and Navigation of the United States for the year ending June 30, 1881.
- From North of England Institute Mining and Mechanical Engineers. Theo. Wood Bunning, Secretary. Newcastle-on-Tyne.
- Transactions. Vol. XXX.
- From F. L. Olmstead, New York :
- The Spoils of the Central Park, New York City.
- From Richard Poits, Chicago :
- Annual Report on the General System of Sewerage of Chicago for 1882. G. Howard Ellers.
- From D. C. Robinson, Elmira, N. Y. :
- The Chemung Crossing Case. New York, Lackawanna and Western R. R. vs. New York, Lake Erie and Western R. R.
- From Collingwood Schreiber, Ottawa, Canada :
- Annual Report of the Minister of Railways and Canals of Canada for 1881.
- Reports of Railway Statistics of Canada.
- From W. W. C. Sites, Jersey City, N. J. :
- The Proposed Dam Across the Passaic River. Pollution of the Passaic River.
- From State Board of Health, Albany, N. Y. :
- Report on the Methods of Sewerage for Cities and large Villages. James T. Gardiner.
- From McRee Swift, New Brunswick, N. J. :
- Hutton's Mathematical Dictionary. Vols. I and II.
- From U. S. Coast Survey, Washington.
- Annual Report of U. S. Coast and Geodetic Survey. 1878.
- From Hon. Jacob Vanderpool, Commissioner Dept. Docks, New York :
- Report of Commission of Engineers upon

Construction of River Wall, Department of  
Docks. (*Copies for distribution.*)  
From L. F. Harcourt, London:  
A Treatise on Rivers and Canals. Vol. I.  
Text. Vol. II. Plates.  
From Joseph E. Waltz, Dayton, Ohio:  
Twelfth Annual Report of the Dayton Water  
Works. 1881.  
From Welton & Bonnett, Waterbury,  
Conn.:  
Fifteenth Annual Report of Waterbury Water  
Commissioners. 1881.

From H. M. Wightman, Boston :  
Annual Report of City Engineer of Boston for  
1881.  
From Gen. H. G. Wright, Chief of  
Engineers, U. S. A., Washington:  
Index to Annual Reports of Chief of Engi-  
neers, U. S. A. 1866-1879.  
Annual Report of Chief of Engineers, U. S. A.,  
for 1881. Parts I, II and III.

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## LIST OF MEMBERS.

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### ADDITIONS.

#### MEMBERS.

	Date of Election.
ASSESSON, PETER C.... Civil Engineer, U. S. N., Norfolk, Va.	July 5, 1882.
LOCKE, AUGUSTUS W.... Manager Troy and Greenfield R. R. and Hoosac Tunnel, North Adams, Mass.	June 7, 1882.
LUDLOW, WILLIAM.... Capt. Corps of Engineers, Bvt. Lieut. Col. U. S. A., Light House Board, Washington, D. C.	July 5, 1882.
PRATT, WILLIAM A.... Engineer Ohio and Baltimore Short Line R. R., Connellsville, Pa.	July 5, 1882.
RAY, NATHANIEL C.... Ass't. Engineer Union Pacific R. R., Boulder, Col.	July 5, 1882.
ROSECRANS, WILLIAM S.. San Francisco, Cal.	July 5, 1882.
SMITH, WILLIAM H.... Res. Engineer, New York, West Shore and Buffalo R. R., Oneida, N. Y.	July 5, 1882.

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#### ASSOCIATE.

NICOL, THOMAS W..... Forlorn Hope, P. O., La..... June 7, 1882.

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#### JUNIORS.

BLANC, FREDERIC N.... Care W. H. Gebhard, 21 Nassau Street,  
New York City, N. Y..... July 5, 1882.  
MACKENZIE, WILLIAM B. Ass't Engineer Intercolonial Railway,  
Moncton, N. B..... June 7, 1882.  
PARSONS, WM. BARCLAY. New York, Lake Erie and Western R. R.,  
Port Jervis, N. Y..... June 7, 1882.

## CHANGES AND CORRECTIONS.

## MEMBERS.

- ANDREWS, JOHN W. .... Chief Engineer and Gen'l. Supt. Midland North Carolina R. R., New Berne, N. C.
- BARNARD, A. P. .... (Care of George H. Parsons) Colorado Springs, Col.
- BATES, ONWARD. .... Pres. Pittsburgh Bridge Co., Pittsburgh, Pa.
- BENYAURD, WILLIAM H. H. Maj. Corps of Engineers, U. S. A., Chicago, Ill.
- BIXBY, WILLIAM H. .... Lieut. of Engineers, U. S. A., Willets Point, New York Harbor, N. Y.
- DARRACH, CHARLES G. .... Ridley Park, Delaware Co., Pa.
- DAVIS, CHARLES E. L. B. Capt. Corps of Engineers, U. S. A., Detroit, Mich.
- DURHAM, C. WHEELER. .... Room 19, Tribune Building, New York City, N. Y.
- FARQUHAR, FRANCIS U. Maj. Corps of Engineers, Bvt. Lieut. Col., U. S. A., Detroit, Mich.
- GLASKIN, EDWIN E. .... 39 Broadway, New York City, N. Y.
- HOUSTON, JOHN. .... P. O. Box 145, Hackensack, N. J.
- JAMES, JOHN C. .... Ch. Eng. Canadian Pacific R. R., Winnipeg, Manitoba.
- JOHN, IRVIN. .... Phoenixville, Pa.
- LINVILLE, JACOB H. .... Morton, Pa.
- LONG, THOMAS J. .... Ass't. Engineer Dep't Docks, 119 Duane Street, New York City, N. Y.
- TRUESDELL, CHARLES. .... Res. Engineer New York, Susquehanna and Western R. R., Delaware Water Gap, Pa.
- WADDELL, JOHN A. L. .... Prof. of Civil Engineering, University of Tokio, Japan.
- WAITE, C. C. .... Vice-Pres. Cincinnati, Hamilton and Dayton R. R., Cincinnati, Ohio.
- WEEKS, HARVEY R. .... Chief Engineer E. K. R. R., Willard, Ky.
- WEIR, CHARLES G. .... 24 East Tenth Street, New York City, N. Y.

## ASSOCIATE.

- HENDRIE, JOHN S. .... Ontario and Quebec R. R., Peterborough, Canada.

## JUNIORS.

- BROOKS, FREDERICK. .... Mexican Central Railroad. San Luis Potosi, Mexico.
- BURDETT, CHARLES L. .... Room 21, Trust Co. Block, Hartford, Conn.
- CURTIS, WENDELL R. .... Rockland, Plymouth Co., Mass.

## DEATHS.

- BIGGS, ROBERT. .... Elected Member October 19, 1870. Died July 24, 1882.
- HYDE, WILLIAM B. .... Elected Member July 12, 1877. Died June 18, 1882.
- CLARK, IRA E. .... Elected Junior February 6, 1878. Died May 23, 1882.

# American Society of Civil Engineers.

## PROCEEDINGS.

Vol. VIII.—August, 1882.

NOTE.—No meetings of the Society are held in August.

### ADDITIONS TO LIBRARY AND MUSEUM.

- From American Academy of Arts and Sciences Cambridge, Mass.:  
Memoirs. Centennial Volume. Vol. XI. Part I.
- From American Chemical Society. P. Cassamajor, Secretary, New York:  
Journal of the Society. Vol. III. 1881.
- From American Society of Mechanical Engineers. Thomas Whiteside Rae, Secretary, New York:  
Proceedings of the Society. Second Regular Meeting, 1881. Altoona, Pa.
- Counter-Balancing of Engines and other Machinery having Reciprocating parts. Prof. S. W. Robinson.
- Comparison between different types of Engines. Charles A. Hague.
- Fire Protection of Mills. C. J. H. Woodbury.
- The Lifetime or Age of Steam Boilers. William Barnet Le Van.
- Mill Floors. C. J. H. Woodbury.
- Railroad Economics, or Notes and Observations from the Ohio State Railway Inspection Service. Prof. S. W. Robinson.
- Method of Arranging and Indexing Drawings and Patterns. Albert F. Hall.
- Rolled Cast-Steel Car Wheels. Jacob Reese.
- Nomenclature of Machine Details. Oberlin Smith.
- The Latest Methods of Submarine Telegraph Work. Thomas Whiteside Rae.
- Note Relating to the Proper Method of Expansion of Steam and Regulation of the Engine. Prof. R. H. Thurston.
- Coffin's Averaging Instrument. John E. Sweet.
- Use of the Calorimeter as a Pyrometer for High Temperatures. J. C. Hoadley, C. E.
- A Rational System of Piston Packing. Prof. S. W. Robinson.
- The Binary Absorption System of Ice Machinery. H. F. J. Porter, M. E.
- Experimental Mechanics. Oberlin Smith.
- The Continuous Rod Mill of the Trenton Iron Co. William Hewitt.
- A Brief Treatise on the Steamboat Cam. Lewis Johnson.
- Most Economical Point of Cut-Off in Steam Engines. No. I. Alfred R. Wolff, M. E., and James E. Denton, M. E.
- Most Economical Point of Cut-Off in Steam Engines. No. II. Alfred R. Wolff, M. E., and James E. Denton, M. E.
- From Association of Engineering Societies. H. G. Prout, Secretary of Board, New York:
- Journal of the Association. Vol. I. No. 7. May, 1882.
- From Eustaquio Buelna, Durango, Mexico:
- Compendio, Historico, Geografico y Estadistico del Sinaloa. Eustaquio Buelna, Mexico, 1881.
- From Mendes Cohen, Baltimore:
- A Complete Set of Reports of the Baltimore and Ohio Railroad from 1827 to 1879, inclusive. Bound in 7 Volumes.
- Fifty-fourth and Fifty-fifth Annual Reports of the Baltimore and Ohio Railroad for the years ending Sept. 30th, 1880 and 1881.
- From Denver Society of Civil Engineers. Arthur I. Fonda, Cor. Secretary, Denver, Col.:
- Constitution and By-Laws, Blank Application and List of Officers of the Society.
- From James B. Eads, St. Louis:
- Answer of James B. Eads, Correcting the Erroneous Statements of the Promoters of the Nicaragua Canal Scheme. Washington, 1882. (Copies for distribution.)

- From Engineers' Club of Philadelphia.  
Howard Murphy, Cor. Secretary:  
Proceedings. Vol. III. Nos. 1 and 2.  
From Franklin Institute. Wm. H.  
Wahl, Secretary, Philadelphia:  
Journal of the Institute. July and August,  
1882.
- From William Frazier, Boston:  
Prospectus of the Paris, Georgetown and  
Frankfort Railroad. Cambridge, 1881.
- From Institution of Civil Engineers.  
James Forrest, Secretary, London:  
Publications edited by the Secretary, as fol-  
lows:  
The Rokugo River Bridge and Foundations  
on the Tokio-Yokohama Railway, Japan.  
Richard V. Boyce.  
Light Scaffolding. John Cundy.  
New York Elevated Railroads. Robert E.  
Johnston.  
Canal Navigation in Belgium. A. Gobert.  
Translated by Alfred Bache.  
The Burning of Town Refuse at Leeds.  
Charles Blagg.  
Lancaster Water Works Extension. James  
Mansergh.  
From Metropolitan Museum of Art. L.  
P. Di Cesnola, Secretary, Central  
Park, New York:  
Twelfth Annual Report of the Trustees of the  
Association. New York, 1881.
- From Mining Institute of Scotland.  
James Gilchrist, Secretary, Hamilton:  
Transactions. Vol. IV, No. 3. General Meeting.  
June, 1882.
- From Joseph Nimmo, Jr., Chief of  
Bureau of Statistics, Washington, D.  
C.:  
Imported Merchandise entered for Consump-  
tion in the United States, with rates of Duty  
and amount of Duties Collected.  
Comparative Rates of Wages in the United  
States and in Foreign Countries. Joseph  
Nimmo, Jr. May 1, 1882
- From North of England Institute of  
Mining and Mechanical Engineers.  
Theo. Wood Bunning, Secretary,  
Newcastle-on-Tyne:  
Transactions. Vol. XXXI. Part 4. June,  
1882.
- From Charles Paine, New York:  
The Culture and Management of our Native  
Forests for Development as Timber or  
Ornamental Wood. H. W. S. Cleveland.  
Springfield, 1882. (Several copies.)
- From Gen. O. M. Poe, U. S. A., Wash-  
ington, D. C.:  
Reports of Inspection made in summer of  
1877, by Generals P. H. Sheridan and W. T.  
Sherman of Country North of the Union  
Pacific Railroad. Washington. 1878.
- From M. E. Pontzen, Paris:  
Notice sur les Appareils Électriques exposés  
par La Société Autrichienne.  
Notice descriptive, des Appareils Électriques  
exposés par la Compagnie du Chemin de  
fer du Nord. Lille. 1881.
- Résumé d'une étude sur la Creation d'un  
Port du Mer à Paris. M. Bouquet de la  
Grye. Paris. 1882.  
Ueber das Technische Schul-und Vereina-  
wesen Franksreich. Wilhelm von Nörd-  
ling. 1881.
- From H. V. Poor, New York:  
Sketch of the Rise and Progress of the Inter-  
nal Improvements, and of the Internal Com-  
merce of the United States, with a review  
of the charges of monopoly and oppression  
made against Railroad Corporations. Henry  
V. Poor. New York. 1881.
- From Royal United Service Institution:  
Capt. B. Burgess, Secretary, London.  
Journal of the Institution. Vol. XXV. No.  
113.
- From John C. Trautwine, Philadelphia:  
The Field Practice of Laying out Circular  
Curves for Railroads. John C. Trautwine,  
C. E. Philadelphia. 1882.
- From U. S. Signal Service, Gen. W. B.  
Hazen, Chief Officer, Washington:  
Professional Papers of the Signal Service as  
follows:  
Isothermal Lines of the United States  
1871-1880. Lieut. A. W. Greely.  
Chronological List of Auroras observed  
from 1870 to 1879. Lieut. A. W. Greely.  
Information relative to the Construction  
and Maintenance of Time Balls. Wins-  
low Upton.  
The Reduction of Air Pressure to Sea  
Level at Elevated Stations West of the  
Mississippi River. Henry A. Hazen,  
A. M.
- From William Watson, Boston:  
A Report to the American Social Science As-  
sociation on the Protection of Life from  
Casualties in the use of Machinery. Wil-  
liam Watson, Ph. D.
- From Gen. Francis A. Walker, Supt.  
Tenth Census of the United States,  
Washington, D. C.:  
Statistics of the Production of the Precious  
Metals in the United States. Clarence King.  
(2 copies)  
Statistics of the Iron and Steel Production of  
the United States. James M. Swank.
- From other sources:  
Introductory Report. Massachusetts Laws.  
Mexican Concessions. By-Laws of the Mexi-  
can Central Railway Co., Limited.  
Second Annual Report of the Board of Direct-  
ors of the Sonora Railway Company, Limited,  
year ending December 31, 1881. Boston.  
1882.  
Massachusetts Laws. Mexican Concessions,  
First Mortgage Deed. By-Laws of the Sonora  
Railway Company, Limited.  
Annual Report of the Chief Engineer of the  
Water Department of Philadelphia for the  
year 1880.  
History of the Boston and Bangor Steamship  
Company, formerly known as Sanford's In-  
dependent Line. (1823-1882.) Boston.

## THE NORMAN MEDAL.

### CODE OF RULES FOR ITS AWARD.

I.—Competition for the Norman Medal of the American Society of Civil Engineers shall be restricted to Members of the Society.

II.—There shall be one gold medal, and only one, struck for each and every fiscal year of the Society, and awarded as hereinafter provided. The dies therefor shall be with the Superintendent of the United States Mint at Philadelphia, in trust exclusively for the above purpose. Such Medal shall be of a cost equal to the annual interest received upon \$1 000 of the Consolidated Stock of the City of New York, Certificate No. 179, of the additional new Croton Aqueduct Stock of the City of New York, authorized by an Act of the Legislature of the State of New York, Chap. 230, passed April 15th, 1870, dated November 17th, 1873, now held in trust by the Treasurer of this Society, and so held solely for this purpose, and shall be executed upon his order.

III.—All original papers presented to the Society by members of any class, during the year for which the medal is awarded, shall be open to the awards, provided that such papers shall not have been previously contributed in whole or in part to any other association, nor have appeared in print prior to their publication by the Society, nor have been presented to the Society in any previous year.

IV.—The Board of Censors to award the Medal shall consist of three members of the Society, to be designated by the Board of Direction. The Secretary of the Society shall act as Secretary to the Board of Censors.

V.—The medal shall be awarded to such paper as the said Board shall judge to be worthy of special commendation for its merits as a contribution to Engineering Science, not merely relatively as compared with others presented during the same year, but as exhibiting the science, talent or industry displayed in the consideration of the subject treated of, and for the good which may be expected to result from the discussion and the inquiry.

VI.—In case no paper presented during the year shall be deemed of sufficient value to receive an award, the amount of the interest of the fund for that year shall be expended by the Board of Direction in the purchase of books, to be offered as a premium for the second best paper in the next year in which more than one paper of sufficient value may be presented.

VII.—The medal year shall terminate on the first day of August, and the award shall be announced at the Annual Meeting.

VIII.—The Treasurer of this Society shall cause the medal to be prepared and delivered to, or deposited to the order of, the successful competitor, within two months after the Annual Meeting at which the same shall have been awarded.

## LIST OF MEMBERS.

## ADDITIONS.

## MEMBERS.

Date of Election.

BURNS, EDWARD COOK..	U. S. Ass. Engineer, Sault Ste. Marie, Mich.....	July 5, 1882.
CLARK, DAVID DEXTER..	Northern Pacific R. R., New Tacoma, Washington Ter.....	July 5, 1882.
SCHUYLER, HOWARD....	Apartado 212, Mexico, Mexico .....	June 7, 1882.

## CHANGES AND CORRECTIONS.

## MEMBERS.

ANDERSON, T. S.....	San Antonio, Texas.
COMSTOCK, C. B.....	Major Corps Engineers, Bvt. Brig. Gen. U. S. A., 33 West Houston Street, New York.
DOANE, W. A.....	Ass. Engineer, Ontario and Quebec Railway, Lock Box 120, Peterborough, Ont. Canada.
KIMBERLY, M. C.....	Gen. Ass. Eng., N. P. R. R., Brainerd, Minn.
NICHOLSON, GEO. B....	190 Common Street, New Orleans, La.
POST, L. W.....	315 Collins Street, Atlanta, Georgia.
WIMMER, S.....	St. Marys, Elk County, Pennsylvania.

## ASSOCIATES.

HAMMOND, H. B.....	67 Wall Street, New York.
LOCKWOOD, JOHN.....	52 Broadway, New York.

# American Society of Civil Engineers.

## PROCEEDINGS.

Vol. VIII.—September, 1882.

### MINUTES OF MEETINGS

(Abstract of such as may be of general interest to members.)

#### OF THE SOCIETY.

SEPTEMBER 6, 1882.—The Society met at 8 P.M., Mr. Theodore Cooper in the chair. Ballots for membership were canvassed and the following candidates were declared elected : as Members—William Herbert Baker, Las Vegas, N. M.; Richard Somers Hayes, St. Louis, Mo.; Horace E. Horton, Rochester, Minn.; Marsden Manson, San Francisco, Cal.; Samuel H. Miller, Danville, Ill.; William Raymond Morley, Hermosillo, Sonora, Mexico; Arthur Bickley Paine, New York City, N. Y.; John Addison Partridge, Syracuse, N. Y.; James Ross, Toronto, Canada; Thomas William Symons, Washington, D. C.; as Associate—Paul S. Reeves, Phoenixville, Pa.; as Juniors—George Edward Thackray, St. Joseph, Mo.; Albert Lowry Webster, Washington, D. C.

The canvass of the vote on the following question was announced :

“Do you consider it expedient and advisable that the Board of Direction of the American Society of Civil Engineers should comply with requests to nominate Engineers from whom may be selected members of advisory professional Boards?”

In the affirmative there were.....	151 votes.
“ “ negative.....	85 “
Total.....	236 votes.

The following deaths were announced :

ROBERT BRIGGS, of Philadelphia, Pa.; elected Member October 19, 1870, died July 24, 1882.

WILLIAM B. HYDE, of Oakland, Cal.; elected Member July 12, 1877, died June 18, 1882.

The Norman Medal, the award of which was announced at the Washington Convention, was presented to the recipient, Mr. L. L. Buck, M. Am. Soc. C. E.

Mr. J. B. Browne, C. E., practically exhibited the working of the Fleuss Diving and Noxious Gas Apparatus and the Safety Lamp, and read a short paper on the subject which was discussed by the members present.



## LIST OF MEMBERS.

## ADDITIONS.

## MEMBERS.

	Date of Election.
MILLER, SAMUEL H....Chief Engineer Chicago and Eastern Illinois R. R., Danville, Ill.....	Sept. 6, 1882.
PAINÉ, ARTHUR B .....Chief Engineer Pennsylvania and New England R. R., 97 Nassau St., New York City, N. Y.....	" "
PARTRIDGE, JOHN A... Div. Engineer New York, West Shore and Buffalo R. R., Syracuse, N. Y..	" "

## JUNIOR.

ROSENWEIG, ALFRED...Ass't. Engineer Mexican Central R. R. (care James Harrington), Tampico, Mexico.....	June 7, 1882.
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## CHANGES AND CORRECTIONS.

## MEMBERS.

BRIGGS, ROSWELL E....Chief Engineer 2d. Div. Mex. Cent. R. R., Aguascalientes, Mexico.	
CUNNINGHAM, JAMES H..Jos. Tillotson & Co., Black Bull St., Leeds, England.	
DOANE, EDWIN A.....Meadville, Pa.	
ENGLE, ROBERT L.....143 Smith St., Cincinnati, Ohio.	
McKEE, CHARLES H...Ass't. Eng'r. Del. and H. C. Co. R. R., Albany, N. Y.	
PETTIT, ROBERT E.....Supt. N. Y. Div. P. R. R., Jersey City, N. J.	
SCHMIDT, MAX E.....Mexican Central R. R., San Luis Potosi, Mexico.	
SMITH, WM. SOOY.....Montauk Block, Room 52, Chicago, Ill.	
WELLINGTON, ARTHUR M.Ass't Gen. Man. Mex. Cent. R. R., Guadalajara, Mex.	
YONGE, SAMUEL H.....Chief Eng'r. Leav. Div. U. S. Improvement Mo. River, Leavenworth, Kansas.	

## ASSOCIATE.

HARRIS, CHARLES M....Sec'y. Parson Steam Co., 95 Liberty St., New York City.
--

## JUNIORS.

BUTTS, EDWARD.....P. O. Box L., Kansas City, Mo.
HAVILAND, ARTHUR....Res. Eng'r N. Y., W. S. & B. R.R., 8 Tweddle Hall, Albany, N. Y.

# American Society of Civil Engineers.

## PROCEEDINGS.

Vol. VIII.—October, 1882.

### MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

#### OF THE SOCIETY.

SEPTEMBER 20TH, 1882.—The Society met at 8 p. m., Vice-President Wm. H. Paine in the chair.

A paper by William Bell Dawson, C. E., on "Rapid Methods of Topographical Surveying," was, in the absence of the author, read by the Secretary, and discussed by Messrs. Bogart, Paine and Stanton.

OCTOBER 4TH, 1882.—The Society met at 8 p. m., Vice-President Wm. H. Paine in the chair.

The Vice-President announced, with appropriate remarks, the death of the late President of the Society, Mr. Ashbel Welch, which occurred September 25th, 1882.

The following preamble and resolutions, presented from the Board of Direction, were adopted :

*Resolved*, That there be entered upon the official Minutes an expression of the great loss this Society has sustained in the death of its President, Ashbel Welch.

In the successful labors of a long life he has constantly added to the respect and dignity of our profession. Thoroughness and conscientiousness were characteristic of all his works, and these qualities, added to a special ability and clear judgment, secured for him in all his personal relations the peculiar confidence and friendship of those who have been associated with him.

His earnest devotion to the high trusts confided to him by this Society has greatly extended its usefulness and its permanent advantage.

*Resolved*, That the Vice-President presiding be authorized to appoint a Committee to prepare a memoir of the late President for publication in the Proceedings of the Society.

Señor Francisco de Garay, C. E., of Mexico, gave an account of the topography of the Valley of Mexico, of the measures taken in the past for its drainage, and of the methods now proposed to be adopted for that purpose. The subject was discussed by the members present.

OCTOBER 18TH, 1882.—The Society met at 8 P. M., Vice-President Wm. H. Paine in the chair.

The death of Henrique Harris, M. Am. Soc. C. E., elected member December 3d, 1879, died October 10th, 1882, was announced, and the Vice-President authorized to appoint a Committee to prepare a memoir for publication in the Proceedings.

A paper by Henry D. Blunden, M. Am. Soc. C. E., on the "Care and Maintenance of Iron Bridges," was read and discussed by Messrs. Macdonald, Cooper, Davis, Worthen, Paine, Sanderson, Emery, Campbell and Shreve.

## OF THE BOARD OF DIRECTION.

AUGUST 8TH, 1882.—Applications were considered.

The President and Secretary presented suggestions received by them in correspondence from a number of members on the subject of the method for preparing a programme of tests to be submitted to the Chief of Ordnance. The President, Vice-President Wm. H. Paine and the Secretary were appointed a Committee on the subject of the preparation of a programme of tests to be submitted to the Chief of Ordnance. The Secretary was instructed, that if the canvass of votes on August 12th, on the subject of nominations of engineers from whom may be selected members of Advisory Boards, shows a majority in favor of such action by the Board of Direction, he should ascertain from the Franklin Institute what mode of procedure will be agreeable to that Institute to comply with the ordinance of the Councils of the City of Philadelphia.

SEPTEMBER 22D, 1882.—A letter was received from the Mayor of Philadelphia, enclosing copy of certain Proceedings of the Franklin Institute in reference to the appointment of experts upon the subject of the water supply of that city. The Secretary reported to the Board that he had requested the Franklin Institute to state what mode of procedure would be agreeable to that Institute to comply with the ordinance of the Councils of the City of Philadelphia. The Secretary was instructed to reply to the Mayor, enclosing a statement of the facts, as far as this Society is concerned, connected with the ordinance referred to, and state that it is the desire of this Board, in accordance with the vote of the Society, to act in compliance with that ordinance.

The vote of the Society on this subject is given in Proceedings for September, Vol. VIII., page 101, *ante*.

The Secretary presented an announcement from the American Society of Mechanical Engineers, stating that arrangements had been made to hold a joint meeting of that Society, together with the American Institute of Mining Engineers and the American Society of Civil Engineers, in memory of the late Alexander L. Holley, on or about November 1st, in the City of New York. The Secretary was instructed to take such measures on the subject as should be proper.

OCTOBER 3D, 1882.—Applications were considered. Upon the recommendation of the Committee on Library, the following resolution was adopted :

That it be recommended to members of the Society having occasion to designate themselves as such, to use the following abbreviations only :

For Honorary Members.....Hon. M. Am. Soc. C. E.  
 For Members.....M. Am. Soc. C. E.  
 For Associates.....Assoc. Am. Soc. C. E.  
 For Juniors.....Jun. Am. Soc. C. E.  
 For Fellows.....F. Am. Soc. C. E.

Under the code of rules for award of the Norman Medal, the Board designated the following named members of the Society as a Board of Censors: George S. Greene, William E. Merrill, John Kennedy.

Quarterly appropriations were made.

A letter from the President of the Franklin Institute of Philadelphia was presented, and in accordance with the suggestions of that letter, the names of fourteen engineers were transmitted for the consideration of that Institute, from which fourteen names might be selected, the nine to be nominated, conjointly with the Franklin Institute, to the Mayor of Philadelphia, in compliance with the ordinance of the Councils of that City.

The death on September 25th, 1882, of Mr. Ashbel Welch, President of the Society, was announced, and the following resolutions were adopted :

For the first time in its history this Society has sustained the loss by death of its President.

The Board of Direction desire to express their deep sense of this loss, and their high appreciation of the purity of character, the professional eminence, and the administrative ability of the late President of the American Society of Civil Engineers, Ashbel Welch.

The Board further desires to place on record an expression of the high regard which their intercourse with Mr. Welch has inspired in his relations as an officer of the Society, as an eminent leader in the profession of Civil Engineering, and as a man.

OCTOBER 18TH, 1882.—A communication from the President of the Franklin Institute, enclosing extracts from the minutes of a meeting of the Board of Managers of that Institute, was presented. The following preamble and resolutions were adopted:

*Whereas*, in a communication from the President of the Franklin Institute, dated October 12th, 1882, and in accompanying extract from the minutes of the Board of Managers of the Franklin Institute, there are presented nine names of engineers as nominated by the Board of Managers of the Franklin Institute for presentation to the Mayor of the City of Philadelphia under the provisions of an ordinance of the Councils of that City, approved June 7th, 1882, and the concurrence of the American Society of Civil Engineers is requested to those nominations. And

*Whereas*, eight of the names of such nominated engineers are selected from the nominations of fourteen engineers heretofore made by this Board, in accordance with the suggestion of the President of the Franklin Institute, and transmitted to him in the letter from the Secretary of this Society, dated October 4th, 1882. And

*Whereas*, one of the names of the engineers nominated by the Board of Managers of the Franklin Institute is not contained in the list of fourteen engineers heretofore nominated by this Board. And

*Whereas*, in the letter of the President of the Franklin Institute, dated October 12th, 1882, it is stated that Mr. J. Vaughan Merrick (the engineer whose name was not contained in the list nominated by this Board) "is a son of the founder of the Franklin Institute, and who "served us acceptably as President. He is an eminent mechanical engineer, for many years at the head of Southwark Foundry, and he is "identified with the best interests of the City of Philadelphia." Therefore,

*Resolved*, That the Board of Direction of the American Society of Civil Engineers accepts the addition of the name of J. Vaughan Merrick, and concurs in the nomination of the nine engineers named in the above-mentioned communication from the President of, and extract from

the minutes of, the Franklin Institute, namely: Frederick Graff, James B. Francis, E. D. Leavitt, Jr., E. S. Chesbrough, William E. Worthen, George S. Greene, William P. Trowbridge, John C. Hoadley and J. Vaughan Merrick.

*Resolved*, That the Secretary communicate this action to the Franklin Institute, and to the Mayor of Philadelphia.

OCTOBER 31st, 1882.—Applications were considered. Appropriations were made. The report of the Nominating Committee was received.

The subject of the commutation of annual dues by a single payment was discussed, and it was determined to recommend to the Society the adoption of a proposed amendment to the Constitution. This amendment will be printed with the Proceedings of the Society for November 1st.

#### ADDITIONS TO

### LIBRARY AND MUSEUM.

From American Iron and Steel Association, James M. Swank, Secretary, Philadelphia:  
Directory of the Iron and Steel Works of the United States, corrected to July 25, 1882.

From Association of Engineering Societies, H. G. Prout, Secretary of Board, New York:  
Journal of the Association. Vol. I. Nos. 8 and 9. June and July, 1882.

From William H. Bixby, Willets' Point, N. Y. Harbor:  
Notes on the Pointe de Grave, River Gironde, France. Lieut. Wm. H. Bixby, Corps of Engineers, U. S. A.

From Boston Public Library, Mellen Chamberlain, Librarian, Boston:  
Thirtieth Annual Report. 1882.

From P. H. Dudley, New York:  
A set of Condensed Diagrams of Track Inspection, New York Central and Hudson River Railroad. August, 1882. P. H. Dudley, C. E.

From Sandford Flemming, Ottawa, Canada:

Letter to the President of the American Association for the Advancement of Science, on the subject of Standard Time for the United States, Canada and Mexico. Sandford Flemming, Chairman Special Committee, Am. Soc. C. E. August, 1882.

From James T. Gardiner, Albany, N. Y.:  
Report of the New York State Survey for the year 1880. James T. Gardiner, Director.

From John J. Gorman, President Fire Commissioners, New York:  
Reports of the Fire Department of the City of New York for the three months ending December 31, 1879, 1880 and 1881.

From Institution of Civil Engineers, James Forrest, Secretary, London:  
Publications edited by the Secretary, as follows:

The Design of Structures to resist Wind Pressure. Charles B. Bender.

The Resistance of Viaducts to Sudden Gusts of Wind. Jules Gaudard.

On the Theory of the Gas Engine. Dugald Clerk.

Steel for Structures. Ewing Matheson.

From McGill University, Montreal, Canada:  
Annual Calendar. 1882-3.

From Mining Institute of Scotland, James Gilchrist, Secretary, Hamilton:

Transactions. General Meeting, July, 1882.

From John Nader, Madison, Wis.:  
The Tides. A paper read before the Academy of Sciences, Arts and Letters, December, 1879. John Nader, C. E.

From H. V. and H. W. Poor, New York:  
Manual of the Railroad of the United States.  
H. V. Poor. 15th Annual Number. New  
York, 1882.

From Société des Ingenieurs Civils,  
Paris;  
Mémoires. August, 1882.

From U. S. Coast Survey, Washington.  
Annual Report of U. S. Coast and Geodetic  
Survey. 1879.

From U. S. Ordnance Department.  
Gen. S. V. Benet, Chief, Washington,  
D. C.

Ordnance Notes, as follows:

Report of Sea-Coast Artillery Practice at  
the Artillery School, Fort Monroe, Va.,  
during the year 1881. Bvt.-Col. Richard  
Lodur.

The Le Boulengé Chronograph Modified by  
M. Prêtre, Capt. of Marine Artillery.

The Progress in Naval Artillery from 1855  
to 1880.

Cavaller de Cuverville. Translated by  
Lieut. C. W. Whipple.

Firing Investigations of the Steel Works  
of Frederick Krupp, made at the Mep-  
pen Firing Grounds. Translated by  
Lieut. E. L. Zalinski.

The Question of Heavy Guns. From the  
*Memorial de Artillerie*. Translated by  
Lieut. Rogers Birnie, Jr.

Range and Position Finding—Past and  
Present. Capt. H. Watkin, R. A.

On the Metallurgy and Manufacture of  
Modern British Ordnance. Col. Mait-  
land, Supt., R. G. F., Woolwich.

Notes on the Manufacture of Small Arms,  
&c., at the Royal Small Arms Factory,  
Enfield Lock. Capt. McClintock.

On the Application of Solid Steel to the  
Manufacture of Small Arms, Projectiles  
and Ordnance. Ferdinand Gautier.

Metrical into U. S. Measures—Conversion

of Metrical into United States Measures,  
and vice versa, with Tables adopted to a  
Comparison of our own with foreign  
Guns. Lieut. Rogers Birnie.

Mechanical Motion. Lieut.-Col. A. R.  
Buntington.

Report on Cranston's Safety Lighting  
Attachment for Lanterns for the Life  
Saving Service. Capt. D. A. Lyle.

The Folger Michelson Densimeter.  
Lieut.-Com. W. M. Folger, U. S. N., and  
A. A. Michelson, Master, U. S. N.

From Gen. H. G. Wright, Chief of Engi-  
neers, U. S. A., Washington, D. C.:

Report upon a Survey of Pass Manchac and  
Bayou Manchac, La., from its Mouth to the  
Mississippi River. Maj. Amos Stickney.

Report upon an Examination of Oregon Inlet,  
North Carolina. Capt. James Mercur.

Communication of the Chief of Engineers  
with report upon a survey made with the  
view of opening a steamboat communication  
from Saint John's River, Fla., by way of  
Topokallja Lake to Charlotte Harbor or Peace  
Creek. Gen. Q. A. Gilmore.

Communication from the Chief of Engineers  
and accompanying report upon a survey of  
the Columbia River at the Dalles, in Oregon.  
Capt. Charles F. Powell.

Communication from the Chief of Engineers  
and accompanying report upon a survey for  
a breakwater in Lake Pontchartrain in the  
vicinity of the New Canal outlet near New  
Orleans. Maj. Amos Stickney.

Testimony before the Select Committee of the  
Senate appointed to investigate and report  
as to the condition of the Potomac River  
Front of Washington. 1882. (2 copies.)

From other sources:

The Library Journal. Vol. VII. Nos. 7-8.  
Report of the Committee on Foreign Affairs  
on the Nicaragua Canal. 1882.

## LIST OF MEMBERS.

### ADDITIONS.

#### MEMBERS.

Date of Election.

BAKER, WILLIAM H. ....	Atchison, Topeka and Santa Fé R.R., Las Vegas, N. M. ....	Sept. 6, 1882.
CALKINS, FRANK A. ....	75 West 127th St., New York City, N. Y. ....	April 5, 1882.
HAYES, RICHARD S. ....	Sr. Vice-President Missouri Pacific Ry., St. Louis, Mo. ....	Sept. 6, 1882.
HORTON, HORACE E. ....	Civil Engineer, Rochester, Minn. ....	Sept. 6, 1882.
LE BARON, J. FRANCIS. ...	U. S. Ass't Engineer, P. O. Box 738, Jacksonville, Fla. ....	June 7, 1882.
MANSON, MARSDEN. ....	U. S. Ass't Engineer, San Francisco, Cal. ....	Sept. 6, 1882.

MARTIN, WILLIAM H....39 Wall St., New York City, N. Y.....Mar. 1, 1882.  
 MORLEY, WILLIAM B....Chief Engineer, Mexican Central Ry.,  
 Paso del Norte, Mexico.....Sept. 6, 1882.  
 ROSS, JAMES.....Gen. Supt. and Chief Engineer, Credit  
 Valley R.R., Toronto, Canada .....Sept. 6, 1882.  
 SURTEES, ROBERT.....Manager Water Works, Ottawa, Canada April 5, 1882.  
 SYMONS, THOMAS W....1st Lieut. Corps of Engineers, U. S. A.,  
 Vancouver Barracks, Washington  
 Territory.....Sept. 6, 1882.

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 ASSOCIATE.

REEVES, PAUL S.....760 S. Broad St., Philadelphia, Pa.....Sept. 6, 1882.

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 JUNIORS.

THACKRAY, GEORGE E...Youngstown Steel Co., Youngstown, O..Sept. 6, 1882.  
 WEBSTER, ALBERT L....U. S. Geological Survey, Winnemucca,  
 Nevada.....Sept. 6, 1882.

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 CHANGES AND CORRECTIONS.

## MEMBERS.

ALDRICH, TRUMAN H...Southern Ave., Mt. Auburn, Cincinnati, Ohio.  
 BURNET, GEORGE, JR...Sewer Department, St. Louis, Mo.  
 DUN, JAMES.....Ch. Eng. St. L. and S. F. R.R., St. Louis, Mo.  
 GODWIN, BRYANT.....Templehofer, Ufer 24, Berlin, S. W. Germany.  
 HARRIS, ROBERT L.....Care J. S. Barnes, 18 Wall St., New York City, N. Y.  
 JOHN, IRVIN.....Phoenix Iron Works, Opelika, Ala.  
 LEHNARTZ, FRED'K W...P. O. Drawer 432, New Orleans, La.  
 NICOLLS, WILLIAM J....261 South Third St., Philadelphia, Pa.  
 ROCKWELL, SAMUEL....1434 Broadway, Kansas City, Mo.  
 SEARLES, WILLIAM H....4 South Water St., Cleveland, Ohio.  
 SEARS, CLINTON B.....Capt. Corps of Eng. U. S. A., 2653 Olive St., St.  
 Louis, Mo.  
 SEELY, THOMAS J.....Supt. Sonora Ry., Guaymas, Sonora, Mex.  
 SHALER, ROBERT A....Eng. Bridges C. M. and St. P. R.R., Milwaukee, Wis.  
 SMITH, FREDERICK H...St. Denis, Md.  
 WIMMER, SEBASTIAN....50 Irving Place, New York City, N. Y.

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 ASSOCIATE.

ANDREWS, EDWARD R...24 Park Place, New York City, N. Y.



## JUNIORS.

ALLEN, JAMES P. . . . . 50 St. Philip St., Charleston, S. C.  
 FERGUSON, JOHN W. . . . . Ass't Eng., N. Y., L. E. and W. R.R., Rutherford, N. J.  
 HORTON, SANDFORD. . . . . 251 Michigan St., Buffalo, N. Y.  
 NOYES, ELLIS B. . . . . 146 Jefferson St., Brooklyn, N. Y.  
 STAATS, ROBERT P. . . . . Ass't Eng. N. Y., L. E. and W. R.R., 187 West St.,  
 New York City, N. Y.

## FELLOWS.

CLARK, EDWARD W. . . . . 35 South Third St., Philadelphia, Pa.  
 GILMAN, CHARLES C. . . . . 71 Broadway, Room 68, New York City, N. Y.

## DEATHS.

HARRIS, HENRIQUE. . . . . Elected Member Dec. 3, 1879. Died Oct. 10, 1882.  
 WELCH, ASHBEL, President of the Society. Elected Member Aug. 7, 1872,  
 Died Sept. 25, 1882.

# American Society of Civil Engineers.

## PROCEEDINGS.

Vol. VIII.—November, 1882.

### MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

#### OF THE SOCIETY.

NOVEMBER 1ST, 1882.—The Society met at 8 P. M., Treasurer J. J. R. Croes in the chair.

The following proposed amendments to the Constitution were regularly submitted :

#### PROPOSED AMENDMENT TO ARTICLE XXII.

Add at end of Article as follows :

Any member of the Society, not in arrears for dues, may compound for future annual dues by the payment of Two Hundred and Fifty Dollars : Provided, however, that each person duly elected a member shall pay the entrance fee and also the annual dues for the current year of his election.

Provided, also, that any member desiring to compound for future annual dues shall have paid the annual dues for a current year before the compounding sum may be available.

Provided, also, that in addition to the sum provided for compounding dues, there shall be paid by each compounding member, resident within fifty miles of the Post Office in the City of New York, the sum of Ten Dollars per year for five years after compounding.

Should a resident member become non-resident at any time during the five years after compounding, he shall be relieved from the payment of such annual sum during the time of non-residence.

Should a non-resident member become resident at any time within five years after compounding, he shall be liable to the annual payment of Ten Dollars for each year of residence up to five years after compounding.

Members compounding shall sign an agreement that they will be governed by the Constitution and By-laws of the Society as they are now formed or as they may be hereafter altered, amended or enlarged ; that in case of their desiring to withdraw their names from the roll of the Society, the amount theretofore paid by them for compounding, and for entrance fees and annual dues, shall be the property of the Society ; that in case of expulsion, the amount paid for compounding shall be returned to the expelled member, but not the amount theretofore paid for entrance fees or for annual dues.

The above amendment is proposed by the following-named members of the Society : William H. Paine, J. J. R. Croes, Joseph P. Davis, George S. Greene, Jr., and John Bogart.

It is recommended by the Board of Direction for adoption, in accordance with a resolution of the Society passed April 5th, 1882, requesting

the Board to submit a plan for life membership, embodying with it a plan for the commutation of dues by one payment.

#### PROPOSED AMENDMENT TO ARTICLE XXXIII.

Amend Article XXXIII. so that it will read as follows :

Proposed amendments to this Constitution must be submitted in writing, signed by not less than five members, on or before the first Wednesday in November, and shall be sent by letter to the members of the Society, at least twenty-five days previous to the annual meeting.

Such amendments shall be in order for discussion at such annual meeting, and may be amended in any manner pertinent to the original amendments by a majority vote of the annual meeting, and if so amended, shall be voted upon by letter-ballot in form as amended by the annual meeting; if not so amended, they shall be voted upon by letter-ballot as submitted; the vote to be counted at the first regular meeting in March.

An affirmative vote of two-thirds of all ballots cast shall be necessary to the adoption of any amendment.

The above amendment is proposed by the following-named members of the Society : William P. Shinn, Charles E. Emery, Joseph P. Davis, G. S. Greene, Jr., and William H. Paine.

#### PROPOSED AMENDMENT.

A new Article :

Whenever twenty or more members shall signify their desire to form a Section of this Society for the advancement of a special branch of engineering, the Board of Direction shall consider such application, and submit it with an expression of opinion to the Society for a letter-ballot. The application shall be granted if two-thirds of the votes be in the affirmative.

Sections authorized as above shall have the privilege of separate meetings for reading of papers and discussions at times and places determined by themselves, but may not assume to transact business in the name of the Society.

The transactions of such sections shall be published by the Society under the usual regulations; but no expense other than for such publication shall be borne by the Society.

The above amendment is proposed by the following-named members of the Society : D. M. Currie, Henry Flad, B. M. Harrod, Smith S. Leach, Robert E. McMath, J. A. Ockerson, H. D. Whitcomb, Thomas J. Whitman, and George Y. Wisner.

On account of the joint meeting of the American Society of Civil Engineers, the American Institute of Mining Engineers, and the American Society of Mechanical Engineers which had been arranged to take place this evening, the meeting of the Society was adjourned to Wednesday evening, November 15th, at 8 P. M., at which time the tellers to canvass the ballots for membership were requested to report.

NOVEMBER 15TH, 1882.—The Society, adjourned from November 1st, met at 8 P. M., Vice-President Wm. H. Paine in the chair.

The tellers to canvass the ballots for membership made their report, and the following candidates were declared elected as members :

Augustus Jesse Bowie, Jr., San Francisco, Cal. ; Collinson Pierrepont Edwards Burgwyn, Richmond, Va. ; Edgar Sheldon Cary, Newburgh, N. Y. ; Frank Hudson Clement, Everett, Pa. ; Frederick Y.

Dabney, Monroe, La. ; Edward Prince (elected Junior, February 6th, 1878), Quincy, Ill. ; George M. Rusling, Newburgh, N. Y. ; Edward Yorke, Guadalajara, Mexico.

An abstract was then read of the answers received to a letter from the President and Secretary of the Society relating to the proposed programme for tests of structural materials, to be furnished to the Ordnance Department of the United States Army, in accordance with the provisions of the law passed at the last session of Congress.

The subject was discussed by members present.

### CONTRIBUTIONS TO THE BUILDING FUND.

By a resolution of the Board of Direction, all contributions to the Building Fund are to be acknowledged, from time to time, by printing lists of the same in the monthly Proceedings of the Society, and in addition to this the names of all those who may subscribe \$100 or more are to be regularly enrolled and published in future lists of the Society under the head of Subscribers to the Building Fund, and they will be entitled to receive one copy of the monthly publications, comprising all papers and transactions of the Society, regularly, for life, for each \$100 subscribed by them ; such copies to be in addition to those which they may be already entitled to if they are Members or Fellows.

The following contributions are acknowledged in addition to those heretofore noted :

Clarke, Reeves & Co.....	\$1 000.00
John W. Bacon.....	100.00
E. B. Van Winkle.....	100.00

### ADDITIONS TO LIBRARY AND MUSEUM.

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| <p>From Association of Engineering Societies, H. G. Prout, Secretary of Board, New York :</p> <p>Journal of the Association. Vol. I., Nos. 10 and 11. August and September, 1882.</p> <p>From B. Baker, London, England :</p> <p>The Forth Bridge. B. Baker, London, 1882.</p> <p>From Robert Ballard, Rockhampton, Queensland, Australia :</p> <p>The Solution of the Pyramid Problem, or Pyramid Discoveries, with a new Theory as to their Ancient Use. Robert Ballard. New York, 1882.</p> <p>Photographs of Queensland Railways.</p> <p>From Henry T. Bovey, Montreal, Canada :</p> <p>Applied Mechanics. Henry T. Bovey, M. A. Montreal, 1882.</p> | <p>From Bureau of Education, Washington :</p> <p>Report of the Commissioner for 1880.</p> <p>From Engineers' Society Western Pennsylvania, Pittsburg :</p> <p>On the Commercial Value of Heating Furnaces of different Types. Ign. Hahn.</p> <p>From John M. Goodwin, Sharpsville, Pa. :</p> <p>Testimony, etc. The Pennsylvania Company, operating the Erie and Pittsburg Railroad, and the Erie and Pittsburg Railroad Company vs. the Sharpsville Company.</p> <p>From Gen. Wm. B. Hazen, Chief Signal Officer, U. S. A., Washington :</p> <p>Report on the Character of Six Hundred Tornadoes. Sergt. J. P. Finley, Signal Corps U. S. A.</p> |
|--|---|

Signal Service Tables of Rainfall and Temperature compared with Crop Productions. 1st Lieut. H. H. C. Dunwoody.

From Clemens Herschel, Holyoke, Mass.: Testing Flume of the Holyoke Water Power Company, at Holyoke, Mass., July 24, 1882.

From G. Howard-Ellers, Chicago: Annual Report on the General Sewerage System of the City of Chicago for the year 1881. G. Howard-Ellers, Chief Engineer.

From Institution of Civil Engineers, James Forrest, Secretary, London: Minutes of Proceedings. Vols. LXIX. and LXX.

Publications edited as follows: Abstracts of papers published in Foreign Transactions and Periodicals. Session 1881-82. Part III.

System of Unloading and Storing Coals at the Beckton Station of the Gas Light and Coke Company. George C. Trewby.

Harbors and Estuaries on Sandy Coasts, with discussion. Leveson Francis Vernon-Harcourt.

Breaking up a Wreck by Dynamite on the lower Danube. Charles H. L. Kuhl.

The Measurement of Velocity for Engineering Purposes. Henry S. H. Shaw.

Account of some Tests of Riveted Joints for Boiler Work. Charles H. Moberly.

Reconstruction of the St. Pinnock and Moorswater Viaducts on the Cornwall Railway. Peter J. Margary.

Plant for the Manufacture of Iodine. Robert Harvey.

The Regulation of Rivers and Waterways with a view to the Prevention of Floods. Gustav Ritter Von Wex. Translated from the German by William A. Bell.

Seacombe Ferry Improvement Works. Wilfrid S. Boulton and John J. Potts.

Coal-Washing. Thomas F. Harvey.

The recent Landslips in the Salt Districts of Cheshire. Edward L. Williams.

Dioptric Apparatus in Lighthouses. Alan Brebner.

Buckle Harbor. James Barron.

The Independent Testing of Steam Engines and the Measurement of Heat used. John G. Mair.

Description of a Composite Screw Tug-Boat. John A. Thompson.

Bo'ness Harbor and Dock Works. Patrick W. Meik.

Corn-Mill Machinery:

I. Various Systems of Grinding Wheat, and the Machines used in Corn-Mills. William P. Baker.

II. Modern Flour-Milling in England. Henry Simon.

III. Roller-Mills, and Milling as practiced in Budapest. William B. Harding.

From William P. Judson, Oswego, N. Y.:

Specifications for Improving Channel at Ogdensburg Harbor, N. Y.

Specifications for Extension of the Oswego Breakwater.

Specifications for Extension of the Piers at Little Sodus Harbor, N. Y.

Specifications for Extension of the Piers at Great Sodus Harbor, N. Y.

Specifications for Extension of the West Pier at Putneyville Harbor, N. Y.

Specifications for Extension of the Piers at Charlotte Harbor, N. Y.

Specifications for Extension of the Piers at Wilson Harbor, N. Y.

Specifications for Extension of the Buffalo Breakwater.

From J. Fras Le Baron, Jacksonville, Fla.:

Annual Reports of the Cochituate Water Board of Boston for the years 1861, 1866, 1867, 1868, 1871, 1872, 1874, 1875.

Report of the Committee to examine the Sources of Water Supply for the City of Providence. Boston, 1868.

Eighth Quarterly Report of the Water Commissioners of Providence. Providence, 1871.

Report of the Chief Engineer of Providence Water Works. Providence, 1871.

Specifications of Materials to be furnished and Work to be executed for Catch-Basins, Drains and Sewers. Lynn, Mass.

Report of Joint Special Committee on Introduction of Water for the City of Lynn, with reports of the Engineer and Chemist. September, 1870.

First and Third Annual Reports of Public Water Board of the City of Lynn.

Report of Jas. P. Kirkwood, C. E., in relation to an additional Water Supply for the City of Lynn, Mass. Lynn, 1876.

Report of the Joint Special Committee on a Supply of Water for Lowell, Sept., 1869. Lowell, Mass.

Thirteenth Annual Report of the Board of Public Works of Chicago year ending March 31, 1874.

First Annual Report of the Watuppa Water Board of Fall River, Mass., Jan. 1, 1875.

New Haven City Year Books for 1871-72 and 1872-73.

Statement of Receipts and Expenditures of the County of Middlesex, Mass., for the year 1872.

Third Annual Report of the Board of Health of Boston, 1875.

General Laws and Resolves passed by the Legislature of Massachusetts during the sessions of 1873-75-76.

Report upon Surveys made with the view of opening a steamboat communication from St. Johns River, Fla., by way of Topokallia Lake to Charlotte Harbor or Peace Creek, by Gen. Q. A. Gillmore, Corps Engs. U.S.A.

Metric System of Weights and Measures. Florida: its Climate, Soil, Productions and Agricultural Capabilities.

Annual Report of the Trustees, Farm Superintendent and Treasurer of the Maine State College of Agriculture and the Mechanic Arts, 1872. Augusta, 1872.

The Metric Reform. From *Scribner's Monthly*, July, 1879.

Our American Italy. Information for the Settler and the Tourist.

Landscape Gardening and Thorough Drainage. Charles Follen and J. H. Shedd. Boston, 1859.

Eighth Annual Report of the Commissioners of Fisheries of the State of New York for the year ending Dec. 31, 1875.

Office of the Trustees, Sanitary Improvement Bonds, Jacksonville, Florida, Sept. 16, 1873.

First Annual Report of the Commissioners of the State Parks of the State of New York, May 15, 1873. Albany, 1874.

Massachusetts Railroads, 1842, 1855.

Third Annual Report of the Board of Rail-

- road Commissioners of Massachusetts. Boston, 1872.
- A Bill to incorporate the Boston and Chicago Railway Trust Co. Boston, 1874.
- Hoosac. The Last Agony of the Great Bore. T. W. Bird. Boston, 1868.
- Report of Hon. Alvah Crocker on the Troy and Greenfield Railroad and Hoosac Tunnel. Boston, 1868.
- Report of the Joint Standing Committee on the Troy and Greenfield Railroad for 1869, 1870, 1872.
- Report of the Corporators of the Boston and Hoosac Tunnel Railroad Company. January, 1875.
- Lexington and Arlington Branch of Fitchburg Railroad. Abstract of Argument of E. H. Derby before the Railroad Committee. (2 copies.)
- Board of Harbor Commissioners, 11th Annual Report, Jan., 1877. Boston, Mass.
- Report of Experiments and Observations on the Concord and Sudbury Rivers, in the year 1861.
- Report of the Commission of Engineers appointed to investigate a permanent plan for the Reclamation of the Alluvial Basin of the Mississippi. Washington, 1875.
- Report of the Engineer-in-Chief of the Illinois and St. Louis Bridge Company, St. Louis, Mo. May, 1868.
- Improvement of Charleston Harbor, S. C. Washington, 1878.
- Report of the Superintendent of the United States Coast Survey, showing the Progress of the Survey during the year 1873.
- Smithsonian Reports, 1873 and 1874.
- School Committee; Report of the Committee on Drawing. Boston, 1874.
- Annual Report of the Massachusetts Agricultural College, 1866.
- The Mineral Wealth, Climate and Rainfall and Natural Resources of the Black Hills of Dakota. Walter P. Jenney, E. M. Washington, 1876.
- From M. Lavoine, Paris, France:  
Notice sur la Construction du Viaduc, de Chastellux. M. Lavoine.
- From MM. Lavoine and Pontzen, Paris, France:  
Les Chemins du fer en Amerique. Tome II. Exploitation, Chemins de fer à voie, Etroite et Tramways. MM. Lavoine et E. Pontzen. Paris, 1882.
- From His Worship the Mayor, Montreal, Canada:  
Annual Report of the City of Montreal for 1881.
- From Midland Institute, Mining, Civil and Mechanical Engineers, Barnsley, England:  
Transactions, Vol. VIII., Part LXI. August, 1882.
- From Charles Paine, New York:  
The Drive Well Cases. Appellant's Brief. U. S. Supreme Court, October Term, 1882. George Payson and William Niles, of Counsel. La Porte, Ind., 1882.
- From Richard Potts, Chicago:  
Sixth Annual Report of the Department of Public Works, City of Chicago, year ending Dec. 31, 1881.
- From Royal United Service Institution, London, England:  
Journal of the Institution, Vol. XXVI., No. 118.
- From W. H. Shock, Engineer-in-Chief, U. S. N., Washington:  
Steam Boilers: their Construction and Management. William H. Shock. New York, 1880.
- From Frederick H. Smith, Baltimore, Md.:  
Rocks, Mineral and Stocks. F. H. Smith. Chicago, 1882.
- From U. S. Light House Board, Washington:  
Aberrations of Audibility of Fog Signals. Arnold B. Johnson. Washington, 1882.
- From U. S. Naval Institute, Annapolis, Md.:  
Proceedings, Vol. VIII., No. 2.
- From U. S. Ordnance Department, Washington:  
Index to Ordnance Notes. Nos. 188 to 205, inclusive. Ordnance notes as follows:  
Field-Gun Carriage. Henry J. Butler, M. Inst. C. E.  
Small-Arm Firing. Capt O. E. Michaelis, U. S. A.  
The Attack of Armor-Clad Vessels by Artillery.
- From Leveson Francis Vernon-Harcourt, London, England:  
Harbors and Estuaries on Sandy Coasts. L. F. Vernon-Harcourt, M. A. M. Inst. C. E.
- From Gen. H. G. Wright, Chief of Engineers, U. S. A., Washington:  
Report of an Examination of the Upper Columbia River and the Territory and its Vicinity. Lieut. Thomas W. Symons.
- Report of the Committee on Foreign Affairs on the Nicaragua Canal.
- From A. F. Wrotnowski, Vera Cruz, Mexico:  
Plan of the Works projected by James B. Eads for the Harbor of Vera Cruz.
- From other sources:  
Report of the President of Northern Pacific Railroad to the Stockholders, at their Annual Meeting, Sept. 21st, 1882.
- Railways in Mexico. An Article by Senor Don Matias Romero, in answer to an article of the Hon John Bigelow, entitled "The Railway Invasion of Mexico," published in *Harper's New Monthly Magazine*, October, 1882.
- Annual Report of the Chicago and North-Western Railway Company for year ending May 31st, 1882.
- First Annual Report of the Columbus, Hocking Valley and Toledo Railway Company, year ending December 31st, 1881.
- Report of the Sub-Committee of the Committee on Cities, relative to Investigating the Feasibility of Underground Telegraphy in Cities, together with the testimony taken at the investigation. New York, 1882.
- Report of the New York State Survey for the year 1880. James T. Gardiner, Director.

## LIST OF MEMBERS.

## ADDITIONS.

## MEMBERS.

	Date of Election.
BOWIE, AUGUSTUS J., JR. . . . .	P. O. Drawer 2220, San Francisco, Cal. Nov. 1, 1882.
BURGWIN, C. P. E. . . . .	U. S. Ass't Engineer, 905½ Main St., Richmond, Va. . . . . Nov. 1, 1882.
CARY, EDGAR S. . . . .	Res. Engineer, New York, Ont. and W. Ry., Newburgh, N. Y. . . . . Nov. 1, 1882.
CLEMENT, FRANK H. . . . .	Div. Engineer South Penna. R. R., Everett, Pa. . . . . Nov. 1, 1882.
DABNEY, FREDERICK Y. . . . .	Chief Engineer and Supt. Vicksburg, Shreveport and Pacific R. R., Mon- roe, La. . . . . Nov. 1, 1882.
PRINCE, EDWARD. . . . .	(Elected Junior Feb. 6th, 1878), Supt. Water Works, Quincy, Ill. . . . . Nov. 1, 1882.
RUSLING, GEORGE M. . . . .	Engineer for Contractors, New York, West Shore and Buffalo R. R., New- burgh, N. Y. . . . . Nov. 1, 1882.

## CHANGES AND CORRECTIONS.

## MEMBERS.

ALLEN, C. FRANK. . . . .	A., T. and S. F. R. R., Topeka, Kansas.
CUNNINGHAM, D. W. . . . .	30 South 7th St., Minneapolis, Minn.
DURHAM, C. WHEELER. . . . .	187 Broadway, New York City, N. Y.
EARLEY, JOHN E. . . . .	(Care W. R. Morley, Chief Engineer Mex. Cent. R. R.), Chihuahua, Mexico.
FOGG, CHARLES E. . . . .	Poughkeepsie, N. Y.
HERING, RUDOLPH. . . . .	Room 18, Tribune Building, New York City, N. Y.
KINNEY, EDWARD C. . . . .	Fort Worth, Texas.
NEILSON, CHARLES. . . . .	Supt. B. and R. Div. N. Y., L. E. and W. R. R., Buffalo, N. Y.
NOBLE, ALFRED. . . . .	Shreveport, La.
OSGOOD, JOSEPH O. . . . .	Milton, Mass.
PRATT, WILLIAM A. . . . .	Chief Engineer Western and Buckhannon R. R., Weston, Va.
RAY, NATHANIEL C. . . . .	Ass't Engineer U. P. R. R., Boise City, Idaho.
SIMPSON, GEORGE H. . . . .	Stamford, Conn.
STAUFFER, D. McN. . . . .	Tribune Building, Room 18, New York City, N. Y.
TALCOTT, COOK. . . . .	88 Cortlandt St., New York City, N. Y.
WIMMER, SEBASTIAN. . . . .	50 Irving Place, New York City, N. Y.

## JUNIORS.

PARSONS, W. BARCLAY. . . . .	N. Y., L. E. and W. R. R., Bradford, Pa.
RAYMOND, CHAS. WARD. . . . .	173 Joralemon St., Brooklyn, N. Y.

## FELLOW.

MERZ, FREDERICK W. . . . .	7 West 31st Street, New York City, N. Y.
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## RESIGNATION.

PETTIT, HENBY. . . . .	Elected Member January 7th, 1874.
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# American Society of Civil Engineers.

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## PROCEEDINGS.

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Vol. VIII.—December, 1882.

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### MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

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#### OF THE SOCIETY.

DECEMBER 6TH, 1882.—The Society met at 8 P. M., Vice-President William H. Paine in the chair. Ballots for membership were canvassed, and the following candidates were declared elected members: Timothy Cookson Bradley, St. Joseph, Mo.; Henry J. Gielow, Town Creek, Ala.; Edward S. Safford, Newburgh, N. Y.; James Dix Schuyler, Sinaloa, Mexico; Thomas Wellington Spencer, Utica, N. Y.; Russell Thayer, Philadelphia, Pa.; Edmund Brownell Weston, Providence, R. I.

A paper on Underground Water Supply was then read by Mr. J. J. R. Croes, M. Am. Soc. C. E., and discussed by Messrs. Joseph P. Davis, George S. Greene, E. H. Keating and J. J. R. Croes.

DECEMBER 20TH, 1882.—The Society met at 8 P. M., Vice-President Paine in the chair.

A paper by William P. Shinn, M. Am. Soc. C. E., on the Increased Efficiency of Railways for the Transportation of Freight, was read by the author, and discussed by Messrs. Chanute, T. C. Clarke, Emery, G. S. Greene, Jr., Macdonald and Shinn.

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#### OF THE BOARD OF DIRECTION.

DECEMBER 6TH, 1882.—Applications were considered. Appropriations were made. The Secretary was requested to prepare the Annual Report.



## MEMOIRS OF DECEASED MEMBERS.

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**MAXIMILIAN HJORTSBERG, M. Am. Soc. C. E.****DIED MAY 16TH, 1880.**

Maximilian Hjortsberg was born November 8th, 1825, in Stockholm, Sweden. He was the youngest son of Lars Hjortsberg, a very eminent actor of Sweden. After his early education he was apprenticed to a builder in Stockholm, and subsequently attended the Polytechnic School in that city. At the age of 19 he went to London, where he was engaged as assistant with a number of prominent engineers, among them Mr. Robert Stephenson, finally being employed upon the construction of the docks at Hull and railway work in that vicinity for about two years.

In 1850 he visited the United States, and, with the exception of a short time in Sweden, he resided since that date in America. He was engaged upon railroad work in Indiana and other States until 1857, when he received an appointment in the engineer service of the Chicago, Burlington & Quincy Railroad, from which he was soon advanced to the position of Chief Engineer. This position he occupied up to 1879, and was distinguished as an important and valuable officer in the perfection of the construction and maintenance of that well-known line. The engineering work was of large extent and of excellent character, and Mr. Hjortsberg became well known as a man of peculiar ability, judgment and energy.

Besides his duties connected with the railroad, he superintended the construction of one of the fine churches in Chicago, rebuilding it also after the great fire. He was also one of the Park Commissioners of that city, and in that capacity had an opportunity for the exercise of his decided artistic tastes. During the last two years of his life he was the Engineer of the Pullman Palace Car Company and was engaged in the construction of their works near Chicago.

He was a man appreciated very highly by other members of our profession, and the sad accident by which he lost his life was deeply felt.

He became a member of the American Society of Civil Engineers July 10, 1872.

**WILLIAM WIERMAN WRIGHT, M. Am. Soc. C. E.**

**DIED MARCH 9TH, 1882.**

William Wierman Wright was born July 27th, 1824, at York Springs, Adams County, Pennsylvania. He came of a Quaker family well known in that part of the State. He was educated at the schools of the neighborhood, and finished his education at the Academy at Gettysburg, under the charge of General Herman Haupt, C.E. He began his engineering career in 1847, under Samuel W. Mifflin, who was in charge of the Mountain Division of the Pennsylvania Railroad, extending from Jack's Narrows to the summit of the Allegheny Mountains. He continued until 1854 in the service of the Pennsylvania Railroad in different grades, up to principal Assistant Engineer, in charge of the Western Division of the main line. While in this service he supervised the construction of the Indiana Branch and the erection of the freight depot at Pittsburgh. In 1855 he became the Chief Engineer of the Memphis & Charleston Railroad. In 1857 he was engaged in the service of the Honduras Inter-oceanic Railroads, under the direction of Mr. John C. Trautwine, C.E., being in Honduras from May, 1857, till May, 1858.

Returning to New York at that time, he was sent to England in the service of the Honduras Company, and traveled extensively in Europe, returning to the United States in 1859. He was subsequently connected with the Waynesburg Branch of the Pennsylvania Railroad up to the beginning of the war, when he entered the service of the Government, and was connected with the Military Railroad Department to the close of the war. In this capacity his services were of the most valuable character.

He was engaged at Washington and Alexandria, and was in charge of the Acquia Creek Railroad, building extensive wharves at that point, and in 1863 was Military Superintendent of Transportation at Harrisburg. In 1864 he was Chief Engineer of the Military Railroads in the Division of the Mississippi, having the appointment also of Colonel of United States Volunteers.

He organized and had charge of a Military Railroad Construction Corps, which did very effective service at Chattanooga, Nashville, and other points. At the close of 1864 he was ordered by General Sherman to Savannah, where he arrived with his construction corps of 1,200 men January 13th, 1865, and was put in charge of the military railroad work in that vicinity. He was present with General Sherman at the time of the negotiations with General Johnston, which closed the war.

In the charge of the work of this Military Railroad Construction Corps during the war, General Wright exhibited remarkable ability, and his operations were of the greatest advantage to the United States Army.

The corps was disbanded May 15th, 1865, and in 1866 he left the military service of the Government, and became General Superintendent of the Eastern Division of the Kansas Pacific Railway; exchanging this position in 1867 for that of Chief Engineer of the same company, in charge of the surveys for the proposed extension of the road to the Pacific Coast. He pushed these surveys with energy until 1868, when he became connected with the Kansas and Missouri Bridge Company at Leavenworth.

He was subsequently connected with the Chicago and Atchison Bridge over the Missouri River, and with many other railroad works in the West.

In 1870 he became Chief Engineer of the Shenandoah Valley Railroad in Virginia, and supervised the surveys for that railroad. He returned to Philadelphia in 1874, when he engaged in general engineering practice.

In 1879 and 1880 he was a member of the Commission of Engineers, convened in the City of Panama by M. de Lesseps, to examine and report upon the proposed route for the Interoceanic Canal.

It will be seen that few American engineers have had a more active or energetic career, and the constant professional engagements confided to General Wright up to the later years of his life prove that his engineering ability was well recognized.

General Wright became a member of the American Society of Civil Engineers March 3d, 1875.

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### CHARLES W. HOWELL, M. Am. Sec. C. E.

DIED APRIL 5TH, 1882.

Major Charles W. Howell, of the Corps of Engineers of the United States Army, died at New Orleans, Louisiana, April 5th, 1882. He was born in Goshen, Indiana; entered the United States Military Academy in 1859, and graduated June 11th, 1863, standing seventh in his class. He was made immediately after graduation First Lieutenant of the Corps of Engineers, and continued attached to that corps to the close of his life. He served with distinction as Military Engineer of the Army of the Potomac, taking part in a number of actions, and being present at the capitulation at Appomattox Court House, April 9th, 1865. He received in 1864 the brevets of Captain and of Major, for gallant and meritorious service. After the war he was for one year with the engineer battalion at Willet's Point, New York harbor, and then was engaged in the work of the improvement of Western rivers until 1868, when he took charge of a survey for the Kansas Pacific Railroad, under the direction of the Secretary of the Interior, making the surveys from

Fort Riley to intersect the Union Pacific Railroad at the 100th meridian. He was subsequently Chief Engineer of the Department of the Missouri, and in June, 1869, he was detailed to New Orleans, in charge of works of public improvement in Louisiana, Texas and the Gulf Coast of the State of Mississippi, in which work he continued until his death. These works were of considerable local importance, and were sufficient to keep Major Howell very actively engaged up to the time when his health, which had been for a long while impaired, forced him to leave his duties.

He became a member of the American Society of Civil Engineers March 3d, 1875.

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## ADDITIONS TO LIBRARY AND MUSEUM.

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- From S. Thayer Abert, Washington, D. C.:
- Annual Report upon the Improvement of Rivers and Harbors in the District of Columbia, Maryland, Virginia and North Carolina. S. Thayer Abert, U. S. Civil Engineer.
- From Aeronautical Society of Great Britain, Fred. W. Breary, Hon. Secretary, London:
- Sixteenth Annual Report of the Society for the year 1881.
- From American Academy of Arts and Sciences, Boston:
- Proceedings of the American Academy of Arts and Sciences. New Series. Vol. IX. From June, 1881, to June, 1882.
- From Association of Engineering Societies, H. G. Prout, Secretary of Board, New York:
- Journals. Vol. I, No. 12, October, 1882. Vol. II, No. 1, November, 1882.
- Index, Vol. I. November, 1881, to October, 1882.
- From Babcock and Wilcox Company, New York:
- Useful Information pertaining to the Generation and Use of Steam. 2 copies. October, 1882.
- From Board of Supervisors, San Francisco, John A. Russell, Clerk:
- Municipal Reports of San Francisco for 1881-82.
- From American Institute Mining Engineers, Dr. T. M. Drown, Secretary, Easton, Pa.:
- The Mines and Mills of Gilpin County, Colorado. A. N. Rogers.
- Some Drift Hematite Deposits in East Tennessee. Edward Nichols.
- The Crystalline Rocks of Virginia, compared with those of New England. Prof. C. H. Hitchcock.
- A Native Process of Smelting Copper Ores in the State of Jalisco, Mexico. Walter B. Devereux.
- High Percentage of Lime in Lead Shaft-furnace Slags. Albert F. Schneider.
- Comparison of Various Methods of Copper Analysis. W. E. C. Eustis.
- Notes on the Geology and Mineralogy of San Juan County, Colorado. Theodore B. Comstock.
- The Mineral Regions of Southern New Mexico. B. Silliman, M.D.
- Notes on some Reactions of Titanium. Mrs. Ellen H. Richards.
- Presence of Tellurium in Copper. T. Eggleston.
- Some Peculiarities in the Occurrence of Gold in North Carolina. Prof. W. C. Kerr.
- Assaying of Silver Bullion. F. C. Blake.
- Hot-Blast Stoves at the Edgar Thompson Furnaces "D" and "E." Julian Kennedy.
- The Comparative Efficiency of Fans and Positive Blowers. H. M. Howe.
- The Occurrence of Gold in the Potsdam Formation, Black Hills, Dakota. Walter B. Devereux.
- Notes on the Relation of Manganese and Carbon in Iron and Steel.
- Charcoal as a Fuel for Metallurgical Processes. John Birkinbine.
- Hæfer's Method of Determining Faults in Mineral Veins. R. W. Raymond.
- The Anthracite Coal-beds of Pennsylvania. Chas. A. Ashburner.
- On the Peculiar Features of the Bassick Mine. L. R. Grabill.
- Silver Milling in Arizona. W. Lawrence Austin.
- Proceedings of the Colorado Meeting, August, 1882.
- The Estimation of Mineral Oil in the Presence of other Oils. Chas. C. Hall.
- From Boston Public Library:
- Bulletin. October, 1882.

- From Bureau of Education, Washington, D. C.:
- Circulars of Information, as follows:
- No. 2, 1882. Proceedings of the Department of Superintendence of the National Educational Association at its meeting at Washington, March 21-23, 1882.
- No. 3, 1882. The University of Bonn.
- No. 4, 1882. Rural School Architecture. National Pedagogic Congress of Spain. Natural Science in Secondary Schools. Instruction in Morals and Civil Government.
- From Dr. C. F. Chandler, Dean of the Faculty School of Mines, Columbia College, New York:
- Circular of Information, School of Mines, 1883-84.
- From Clarke, Reeves & Co., Phoenixville, Pa.:
- Two framed photographs of Kinzua Viaduct.
- From Wm. Paul Gerhard, New York:
- First Report of the Royal Sanitary Commission. London, 1869.
- House Drainage and Sanitary Plumbing. Wm. Paul Gerhard. New York, 1882.
- From George S. Greene, Jr., New York:
- Annual Report of the Department of Docks. April 30, 1882. (Several copies.)
- From Institution of Civil Engineers, London:
- Abstract of Papers in Foreign Transactions and Periodicals. Vol. LXX. Session 1881-82. Part IV.
- From Institute of Engineers and Shipbuilders, Glasgow, W. J. Millar, Secretary:
- Transactions. Vol. XXV. 1881-82.
- The Dimensions of Cast Iron at various Temperatures, with more special reference to the phenomena of the solid floating on the molten metal. W. J. Millar, C.E.
- From Institute of Mechanical Engineers, London:
- Proceedings. August, 1882. Leeds Meeting.
- From Wm. P. Judson, Oswego, N. Y.:
- Specifications for the Extension of the Oswego Breakwater. November 23, 1882.
- Specifications for the Extension of the Buffalo Breakwater.
- From John Kennedy, Montreal:
- Report on the St. Lawrence Bridge and Manufacturing Scheme. John Kennedy. Montreal, 1882.
- From J. Francis Le Baron, Jacksonville, Fla.:
- Specifications for River and Harbor Improvements—Fla., Texas, Wis., Minn., Pa., Mich., Me., N. H., Mass., R. I., Conn., N. C., N. J., Va., Md., Del., Ill., Iowa, Cal. Dredging, Jetties, Dams, Revetments, Dykes, Piers, Crib-work, Dredges, Tugs and Scows.
- Florida: Its History, Topography, Climate, Soil, Resources and Natural Advantages. A. A. Robinson. Tallahassee, 1882.
- From John Lockwood, New York:
- Bolt from Flanged Pipe on Force Main of New Brighton, Staten Island, Water Works, cut off by sand blast from a leak. Had been in a year when discovered.
- From Capt. D. A. Lyle, U.S.A., Boston:
- Report on the Manufacturing and Use of Files and Rasps. Capt. D. A. Lyle and Samuel W. Porter.
- From the Massachusetts Institute of Technology, Boston:
- Abstract of the Proceedings of the Society of Arts for 1879, 1880, 1880-1881, 1881-1882.
- From W. H. McFadden, Philadelphia:
- Annual Report of the Philadelphia Water Department, 1881.
- From Isaac Newton, New York:
- Report of the Department of Public Works for the Quarter ending December 31, 1880, and Annual Report for 1881.
- From North of England Institute of Mining Engineers:
- Transactions, Vol. XXXI., 1881-2.
- From H. V. and H. W. Poor, New York:
- Manual of the Railroads of the United States. H. V. Poor. New York, 1882. 15th Annual Number.
- From Charles Paine, New York:
- Prospectus. Chicago, St. Louis and New Orleans Railroad Co. W. H. Osborn. Dec. 30, 1882.
- From Pi Eta Scientific Society, Troy:
- Papers read before the Society. Vol. 2, No. 5, December, 1882.
- From Seismological Society of Japan:
- Transactions. Vol. IV., January to June, 1882.
- From Société des Ingénieurs Civils, Paris:
- Memoires. August and September, 1882.
- From Robert Surtees, Ottawa, Canada:
- Annual Report of the Water Works Committee, with Official Reports for 1882.
- From United States Lighthouse Board, Washington:
- Annual Report of United States Lighthouse Board for the year ending June 30, 1882.
- From United States Naval Institute, Annapolis, Md.:
- Proceedings. Vol. VIII., No. 3, 1882.
- From George L. Vose, Boston:
- The Training for Students in Civil Engineering. George L. Vose. New York, 1882.
- From W. L. Webber, East Saginaw, Mich.:
- Inter-State Commerce. Its Regulation by Congress. W. L. Webber.
- From H. M. Wightman, Boston:
- Ninth Annual Report of the Boston Water Board. Boston, 1882.
- From Chas. E. Wright, Commissioner of Mineral Statistics, Marquette, Mich.:
- Annual Report of the Commissioner of Mineral Statistics of the State of Michigan for 1882. Lansing, 1882.
- From Ordnance Department, U. S. A. Gen. S. V. Benét, Chief, Washington, D. C.:
- Ordnance Notes, as follows:
- Tire-Upsetting Machine. Designed by A. T. Brewer. Captain John G. Butler. No. 206.
- Torpedoes. Their Disposition and Radius of Destructive Effect. Lieut. Com. C. F. Goodrich, U. S. N. No. 207.
- A Proposed Armament for the Navy. Com. E. Simpson, U. S. N. No. 209.
- The Type of (I.) Armoured Vessel, (II.) Cruiser, best suited to the present needs of the United States. (Prize Essay, 1881.) Lieut. E. W. Very, U. S. N. No. 210.

The U. S. Steamer Alarm. Lieut. R. M. G. Brown, U. S. N. No. 211.

Chemical Theory of the Combustion of Gunpowder. R. Bunsen and L. Schischkoff. No. 212.

The Development of Armor as applied to Ships. Lieut. Jacob W. Miller, U. S. N. No. 213.

Preservation of Wood. Prof. Chas. E. Monroe, U. S. N. A. No. 214.

The Employment of Torpedoes in Steam Launches against Men-of-War. Lieut. Charles Chabaud Arnault. No. 215.

Wallace's Intrenching Tool. Major N. W. Wallace. No. 217.

Deviations of Small-Arm Projectiles. Capt. John E. Greer. No. 225.

Recent Experiments with an 11-inch Compound Armor Plate at Shoeburyness. Maj. D. D. T. O'Callaghan, R. A.

The Supply of Ammunition to Infantry on the Field of Battle. A. Mariotti.

On the Interior Economy of a Prussian Regiment. Capt. J. Rutherford Lumley.

The Bombardment of Alexandria by the English Fleet, July 11, 1882. Translated by Lieut. C. W. Whipple.

From John Wiley & Sons, New York:  
The Railroad Spiral. Wm. H. Searles, C. E. New York, 1882.

From other sources:  
Report of the Proceedings of the Sixteenth Annual Convention of the Master Car Builders' Association held in the City of Philadelphia, June 13, 14, 15, 1882. New York, 1882.

Papers on Mechanical Subjects. Sir Joseph Whitworth, Bart., F.R.S., D.C.L., LL.D. Vol. 1. True Planes, Screw Threads and Standard Measures.

## LIST OF MEMBERS.

### ADDITIONS.

#### MEMBERS.

Date of Election.

GIELOW, HENRY J.....	U. S. Asst. Engineer, Town Creek, Ala.,	Dec. 6, 1882.
SAFFORD, EDWARD S.....	Div. Engineer, New York, West Shore and Buffalo R. R., Newburgh, N. Y.,	Dec. 6, 1882.
SCHUTLER, JAMES D.....	Chief Engineer and Gen. Supt. Sinaloa and Durango R. R., Culiacan, Mex., via San Francisco and Mazatlan...	Dec. 6, 1882.
SPENCER, THOMAS W.....	Div. Engineer New York, West Shore and Buffalo R. R., Utica, N. Y.....	Dec. 6, 1882.
THAYER, RUSSELL.....	Chief Engineer and Supt. Fairmount Park, 232 South Twenty-second St., Philadelphia, Pa.....	Dec. 6, 1882.
WESTON, EDMUND B.....	Engineer Water Dept., Lock Box 1071, Providence, R. I.....	Dec. 6, 1882.
YORKE, EDWARD.....	Chief Engineer Pacific Line, Mexican Central R. R., Guadalajara, Xalisco, Mexico.....	Dec. 6, 1882.

### CHANGES AND CORRECTIONS.

#### MEMBERS.

BILLIN, CHARLES E.....	Care Engineers' Club, 1518 Chestnut St., Philadel- phia, Pa.
BLICKENSBERFER, ROBERT	Supt. Idaho Div. U. P. R. R., Pocatella, Idaho.
CANFIELD, EDWARD.....	Supt. South. Div. N. Y., Ont. and W. Rwy, Tappan, N. Y.

CONSTABLE, CASIMIR.....2035 Seventh Ave., New York City, N. Y.  
DUNCKLEE, JOHN B.....2136 Penn. Ave., Washington, D. C.  
FORSYTH, ROBERT.....15 Walton Place, Chicago, Ill.  
GLOVER, OLIVER L.....Chief Engineer, Salvador Cent. Bwy., La Union,  
Salvador, C. A.  
HERMANY, CHARLES.....Chief Engineer Water Works, 549 Third St., Louis-  
ville, Ky.  
NOBLE, ALFRED.....43 Campbell St., Detroit, Mich.  
OLNEY, LAFAYETTE.....Newburgh, N. Y.  
SEARLES, WILLIAM H... Beach Creek, Clinton Co., Pa.  
SEAWALL, JOSEPH S.....481 Carroll St., St. Paul, Minn.  
SEYMOUR, CHARLES.....Chief Engineer S. E. and S. E. R. R., Palestine, Ill.  
SHINN, WILLIAM P... Vice-President N. Y. Steam Co., 22 Cortlandt St.,  
New York City, N. Y.  
SYMONS, THOMAS W.....Lieut. Corps of Engineers, U. S. A., Hotchkiss,  
Tenn.  
WIMMER, SEBASTIEN.....St. Mary's, Elk Co., Pa.

**JUNIOR.**

BURNHAM, GEORGE, JR. . . . 500 North Broad St., Philadelphia, Pa.

## RESIGNATIONS.

**MEMBERS.**

BECKWITH, ARTHUR . . . . . December 31, 1882.  
 COPELAND, GEORGE M. . . . . December 31, 1882.  
 LOWTHORP, FRANCIS C. . . . . December 21, 1882.

# PROCEEDINGS

OF THE

## AMERICAN SOCIETY

OF

# CIVIL ENGINEERS.

(INSTITUTED 1852.)

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VOL. IX.

JANUARY TO DECEMBER, 1883.

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PUBLISHED BY THE SOCIETY.

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1883.



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# American Society of Civil Engineers.

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## PROCEEDINGS.

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Vol. IX.—January, 1883.

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### MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

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#### THE ANNUAL MEETING OF THE SOCIETY.

JANUARY 17TH, 1883.—The Society met at 10 A. M., Vice-President William H. Paine in the chair; John Bogart, Secretary. Messrs. Samuel M. Gray, J. G. Van Horne and F. A. Calkins were appointed tellers of the vote to be canvassed for officers of the Society.

The Secretary then read the Annual Report of the Board of Direction,\* which was, on motion, accepted.

The Report of the Treasurer \* was then read and accepted.

The Report of the Finance Committee \* was then read and accepted.

On motion, the Committee on a Uniform System for Tests of Cements was continued.

The Report of the Committee on Uniform Standard Time was presented as follows:

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\* Printed separately.

REPORT OF THE SPECIAL COMMITTEE ON STANDARD TIME,  
AMERICAN SOCIETY OF CIVIL ENGINEERS, NEW  
YORK, JAN. 17TH, 1883.

The Special Committee on Standard Time beg leave to submit the following report:

In accordance with the resolution of the Society, at the meeting at Washington, on the 17th of May last, the Committee have continued their efforts to effect the objects set forth in the report then presented. Agreeably to the instructions of the meeting, a petition was forwarded to the Congress of the United States, respectfully praying that steps be taken for the establishment of a prime or zero meridian.

On the 3rd of August last, the following Joint Resolution was passed by Congress:

JOINT RESOLUTION.

To authorize the President of the United States to call an International Conference to fix on and recommend for universal adoption a common prime meridian to be used in the reckoning of longitude and the regulation of time throughout the world.

*Resolved by the Senate and House of Representatives of the United States of America in Congress assembled, That the President of the United States be authorized and requested to extend to the Governments of all nations in diplomatic relations with our own an invitation to appoint delegates to meet delegates from the United States in the City of Washington, at such time as he may see fit to designate, for the purpose of fixing upon a meridian proper to be employed as a common zero of longitude and standard of time reckoning throughout the globe; and that the President be authorized to appoint delegates, not exceeding three in number, to represent the United States in such International Conference.*

The President of the United States, on the 5th December, 1882, informed Congress by message that he had directed the Secretary of State to address foreign Governments in conformity with the terms of the Joint Resolution.

On the 31st July, 1882, the Chairman of the Special Committee addressed a letter to the President of the American Association for the Advancement of Science. A copy is appended.

The Chairman attended the meeting of the Association held in August, in Montreal, and took part in the discussion on the question of standard time. He explained the action taken by this Society and the course suggested in his letter to the President of the Association. A committee was appointed to represent the Association at the proposed Convention, and generally to assist and co-operate in the objects referred to in the communication.

In the report of the Special Committee presented to the Society at the Washington Convention last May, it was set forth that a pamphlet containing various documents bearing on the subject of time-reform had been circulated; that a series of questions prepared with the view of eliciting all shades of opinions had been issued; and that replies had been received from many prominent men connected with the profession, with railways and telegraphs, and with scientific bodies. These replies embrace opinions on each of the eleven questions submitted from 137 different sources in the United States, Canada and Mexico. They have been classified and printed. They present much interesting and valuable information, and are marked by a striking unanimity on the main questions.

Since these replies to questions were published, other replies have been received, among which are communications from the managers of two great trans-continental railways entirely approving of the scheme issued by the Committee last March. In one case the manager states that he has experimentally applied the system, with the happiest results.

At the Washington Convention the Committee felt warranted in reporting the general opinion in every section of the country heard from, as follows: "The opinion has also been generally expressed that while our 'time system should be in harmony with that of other nations, the 'necessity for reform on this continent is so urgent that we should not 'wait for other nations to move in the matter. That we should, as soon 'as practicable, inaugurate a system, the primary object of which would 'be to meet our own requirements. But that in taking the initiative we 'should by all means adopt a system capable of extension to the whole 'globe, and that we should to some extent give other nations an opportunity of co-operating with us."

The recent action of Congress is a most important step in the movement to bring into operation the views set forth by the Society. The adoption of an initial meridian or time-zero, to be used by all nations, will at once serve our own purposes on this continent and establish the key to ultimate entire uniformity of system everywhere. The International Conference will be convened directly for the establishment of an initial meridian. This determination will have an important bearing on the regulation of time, but the question of standard time itself may with advantage be considered separately, and in anticipation of a settlement of the international question in the manner prescribed by Joint Resolution of Congress.

The Committee accordingly submit that the interests of the public will be best consulted by the calling of a Convention to examine into all the considerations bearing on the questions of time-reckoning, and to determine and recommend a system for regulating time which will secure the greatest advantages to all interested in every locality in North America. In the opinion of the Committee, the Convention should consist of delegates representing railway, telegraph and transportation

corporations, scientific societies, chambers of commerce, Departments of State and other bodies interested, in the United States, Canada and Mexico.

The documents referred to are appended.

Special Committee.	{ SANDFORD FLEMING, <i>Chairman</i> , CHARLES PAINE, THEODORE N. ELY, J. M. TOUCEY, J. E. HILGARD, T. EGLESTON.
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#### DOCUMENTS APPENDED.

1. Letter from the Chairman to the President of the American Association for the Advancement of Science, July 31st, 1882.
2. List of persons from whom replies have been received to the series of questions issued by the Special Committee.
3. Additional list of persons from whom replies have been received to the series of questions (MSS.).
4. Classified replies (1 to 137, inclusive) to the series of questions (printed).
5. Additional replies (138 to 146, inclusive) to the circular of questions (MSS.).
6. Questions issued in March, 1882, by the Special Committee.

On motion, the report was accepted and the Committee continued.

On motion, the following resolutions were adopted:

*Resolved*, 1. That the report submitted by the Special Committee on Standard Time be accepted, and that the Committee be continued, and requested to take all such steps as they may consider expedient and necessary to carry out the views of the Society in respect to the important question referred to them.

*Resolved*, 2. That it is in the public interest that a convention be held at as early a date as practicable to examine into the question of regulating time for railway, telegraph and civil purposes generally, and to determine and recommend a system of standard time which will secure the greatest advantage to all interested throughout North America.

*Resolved*, 3. That every important interest affected by the regulation of time should be represented in the proposed Convention, and that it should specially consist of delegates from railway, telegraph and transportation corporations, scientific bodies, chambers of commerce and Government departments.

*Resolved*, 4. That the Society is prepared to be represented by delegates in the Convention, and to co-operate with other bodies in respect to it.

*Resolved*, 5. That if, on ascertaining the views of other bodies interested in the movement, and it be deemed expedient to do so, a petition may be forwarded to Congress, in the name of the Society, respectfully praying that steps be taken for the calling of the Convention.

The tellers presented the canvass of the ballot for officers, and the following members were declared elected officers of the Society for the ensuing year :

*President*: CHARLES PAINE.

*Vice-Presidents*: WILLIAM H. PAINE, HENRY FLAD.

*Secretary and Librarian*: JOHN BOGART.

*Treasurer*: J. JAMES R. CROES.

*Directors*: GEORGE S. GREENE, JR., JOSEPH P. DAVIS, WILLIAM METCALF, WILLIAM E. MERRILL, WILLIAM G. HAMILTON.

The Board of Censors to award the Norman Medal—Messrs. George S. Greene, William E. Merrill and John Kennedy—then presented their report, awarding the medal to the paper, "Description of Some Experiments on the Flow of Water made during the Construction of Works for Conveying the Water of Sudbury River to Boston." The authors of this paper are Messrs. A. Fteley and F. P. Stearns, members of the Society.

The Secretary then presented a canvass of the suggestions that had been made by members in response to the circular in reference to the place and time for the next Annual Convention of the Society, as follows :

Minneapolis was suggested by.....	74
San Francisco " " .....	13
Chicago " " .....	11
New York " " .....	5
St. Paul " " .....	4
St. Louis " " .....	4
Philadelphia " " .....	2
Denver " " .....	2

And the following named places by one each: Toronto, Detroit, White Sulphur Springs, Pittsburgh, Newport, Louisville, Cincinnati, Jacksonville, Fla., Milwaukee, Memphis.

The month of June was suggested by.....	51
" " May " " .....	25
" " July " " .....	12
" " January " " .....	4
" " August " " .....	4
" " February " " .....	2

And one for each of the following :

April, September and October.

An invitation from the officers of the National Exposition of Railway



Appliances, to be held at Chicago in June next, was then presented, asking this Society to hold its Convention at Chicago during the time of that Exposition.

A letter was presented from D. J. Whittemore, M. Am. Soc. C. E., renewing the invitation to the Society to hold its Convention at Minneapolis or St. Paul. After discussion it was, on motion, resolved that the determination of the time and place for the next Convention should be referred to the Board of Direction, with power to make all requisite arrangements.

Proposed amendments to the Constitution were then discussed.

The first amendment regularly proposed is :

Proposed amendment to Article XXII.

Add at end of article as follows :

Any member of the Society not in arrears for dues, may compound for future annual dues by the payment of Two Hundred and Fifty Dollars; Provided, however, that each person duly elected a member shall pay the entrance fee and also the annual dues for the current year of his election.

Provided, also, that any member desiring to compound for future annual dues shall have paid the annual dues for a current year before the compounding sum may be available.

Provided, also, that in addition to the sum provided for compounding dues, there shall be paid by each compounding member, resident within fifty miles of the Post Office in the City of New York, the sum of Ten Dollars per year for five years after compounding.

Should a resident member become non-resident at any time during the five years after compounding he shall be relieved from the payment of such annual sum during the time of non-residence.

Should a non-resident member become resident at any time within five years after compounding, he shall be liable to the annual payment of Ten Dollars for each year of residence up to five years after compounding.

Members compounding shall sign an agreement that they will be governed by the Constitution and By-Laws of the Society as they are now formed or as they may be hereafter altered, amended or enlarged ; that in case of their desiring to withdraw their names from the roll of the Society, the amount theretofore paid by them for compounding, and for entrance fees and annual dues, shall be the property of the Society ; that in case of expulsion, the amount paid for compounding shall be returned to the expelled member, but not the amount theretofore paid for entrance fees or for annual dues.

The CHAIR.—This proposed amendment is now before you.

Mr. HAIGHT.—When moving an amendment to the proposed amendment of Article 22 of the Constitution, it seems proper I should give my reasons therefor. It seems desirable that an article to be incorporated in our Constitution should contain less provisos than the one submitted, and should be more determinate in its language. The proposed amendment, while favoring present non-resident members by requiring that they should pay no annual dues if they remain non-residents for five years after compounding, even though all their after years be spent where they will be classed as residents, discriminates unfairly against present resident members, who may not be residents after five years from the time of compounding. Present non-resident members, not being required to pay annual dues if they remain non-residents for five years, may spend the after years of their lives within the limits of resi-

dency without being required to pay more. Requiring those compounding to again subscribe to the Constitution and By-Laws only weakens the force of the obligations incurred by subscribing to Form A in the Appendix, as required by Article 22. It seems to me that once subscribing to the Constitution and By-Laws should be of sufficient force to abide forever, so long as the person is a member. The proposed amendment, by providing for return of the compounding fee to members who are expelled, appears to be offering a premium to those persons designing to withdraw from the Society, to perform acts which will lead to their expulsion. In the amendment I now propose there are no provisos incorporated, and no distinction is made between resident and non-resident members, as the itinerant nature of our profession makes it possible or probable that a few years may cause an entire reversal of the conditions of many in that respect. As the benefits of compounding will be received principally by those least needing them, because of their being best able to pay largely, it appears as though the compounding fee should be so large that the Society should be benefited thereby. As it is desirable that the indebtedness upon the building should be liquidated as speedily as possible, it would be well that a member should be encouraged to contribute to the Building Fund; and simple justice requires that members in adverse circumstances should not be liable to expulsion because of their indebtedness to the Society, so long as their indebtedness is less than the amount of their previous voluntary contributions.

I therefore move, as a proposed amendment to the amendment, the substitution of the following therefor :

"Any member of the Society, after having paid his entrance fees and the annual dues for the year of his becoming a member, and not in arrears to the Society, may compound for future annual dues by the payment of \$300. All sums paid for entrance fees, for the Building Fund, for annual dues, or for compounding for annual dues by virtue of this amendment, shall be the property of the Society, and no portion thereof shall be returned by reason of resignation or expulsion of a member so compounding. No person shall be liable to expulsion because of being in arrears to the Society, unless the amount of his indebtedness shall exceed the amount of his previous contributions to the Building Fund."

The SECRETARY.—In order to do that, sir, you will have to amend another article of the Constitution. One of our troubles in the past has been that amendments have been offered which have affected other articles, and the proposers have not thought of that, and we have had, several times in the past, conflicting provisions. The reason of the number of provisos is that there should be no such conflict. This proposed amendment immediately conflicts with another definite article of the Constitution.

Mr. LOCKWOOD.—Mr. Haight's motion was not seconded.

The CHAIR.—Is this amendment seconded ?

The amendment was not seconded.

The CHAIR.—Discussion on the original proposed amendment is in order. I will make an explanation, as my name appears as one of the proposers of the original amendment. When the subject of compounding for dues came up a long time since and was referred to the Finance Committee, there was such a state of our finances at that time, that the propositions then presented could not be entertained with safety. I am pleased to say that our finances are advanced to a better standing, and we are now in position, as the Finance Committee thinks, to take advantage of, and present the sum that is here mentioned as a proper sum for compounding ; and that is why it is presented by the Finance Committee to the Board of Direction, and through the Board of Direction to the Society.

General G. S. GREENE.—This provides for a life membership.

The SECRETARY.—Yes, sir ; that is it.

The CHAIR.—Yes, sir. In other words, we think the finances will stand this sum.

Mr. CROES.—Mr. Chairman, there is a question raised by a gentleman sitting near me with regard to the reason for putting in the proposition that in case of expulsion the amount paid for compounding should be returned to the expelled member. I would like to have from the Secretary, as he has looked into that matter, his presentation of the case—why, after full discussion, it was so proposed by the Board of Direction.

The SECRETARY.—The reason for that is to avoid the possibility of a legal complication such as recently occurred in this city. The ground of a suit against a club was, that once having paid a fee for life membership, the club did not have the right to expel a member; that he thereby obtained a corporate right in the club, which he could not be deprived of. The point has been made that if there had been a provision in the law of the club, that in case of expulsion that sum for life membership should be returned, and this was agreed to at the time of subscribing, then there would be no question. Expulsion, of course, is an exceedingly improbable matter to come up. We never had a case of it in this Society at all. We have had a good many suspensions for non-payment of dues, but that is not expulsion. One article of the law of the Society refers to a person who shall not pay his dues, that he ceases to be a member, but that is not expulsion. That cannot affect a man who has paid his \$250, for there are no more dues to pay ; but there is a special provision in regard to the expulsion of a member after due trial, etc.

Now, as that can come up only in very extreme cases, it has been suggested that the safest way would be to avoid all possible legal complications. If we expel a man we might just as well not have his money ; we have had the interest on it while he was a member, and

therefore, under the advice the Secretary took, that clause was put in. The Secretary was told that the clause would avoid all possible trouble. The Society can better afford to lose the amount, having had the interest during the time of membership, than to give the member any possible legal ground for controversy.

General G. S. GREENE.—Would not it be just as well, when he compounds, to get a statement from him that he submits to the rules?

The SECRETARY.—The amendment provides that members compounding shall sign such an agreement.

General G. S. GREENE.—Then why is it necessary to return the money?

The SECRETARY.—Because a lawyer told me it would be better.

General G. S. GREENE.—Has that case been decided against the club referred to?

The SECRETARY.—No, sir; it is in the courts yet.

Mr. COOPER.—In reference to this whole matter, I cannot help thinking as I did when I saw the circular, that it does not seem to be prudent, under the present circumstances, to adopt this method of compounding, although I am in favor of it as a member. If I am correctly informed, we now have some surplus funds. But a very considerable portion of this is made up from the payment of entrance fees. Until we have a permanent fund—enough to pay the Secretary and clerk hire, and enough to perfect the library in addition—I think we ought to get all the fees we can. Until we are entirely above board and have everything in the shape it ought to be, I think we should hesitate in this matter.

Mr. CROES.—The reason for making resident members pay more for five years, was because it was thought possible that the applications for compounding might come largely from them, and the Society could not afford to lose the extra amount that resident members annually pay. The interest on \$250 is not enough to pay the annual dues of resident members. They now pay \$10 a year more than non-resident members do, and for a few years, at any rate, until the income of the Society becomes larger by accessions, we could not afford to lose that amount; therefore it is proposed that for five years resident members should pay \$10 more each year. That is, it actually made resident members pay \$300. They could pay it in a sum of \$300 or in annual installments of \$10 each. At the end of the five years it was hoped the Society would be able to continue the sum alike for resident and non-resident members.

Mr. SHINN.—I would like to ask the Secretary whether he has taken any advice, or considered the condition that would arise in case any resident member paid \$250, and then became in arrears for his annual payment of \$10 a year for five years? That is the point.

The SECRETARY.—Yes; we talked about that.

Mr. J. P. DAVIS.—He would not be entitled to vote; that is all.

**Mr. SHINN.**—Would he cease to be a member under Article 27 of the Constitution ?

**Mr. J. P. DAVIS.**—I should say he would.

**Mr. SHINN.**—What would become of the \$250 that he paid for a life membership ? I only raise the question to ask whether it had been considered, and what view was taken of it. It did not occur to me until this discussion began.

**The SECRETARY.**—Well, he was to be liable to the annual payment of \$10 for five years—no, I don't know what would happen. I don't know.

**Mr. SHINN.**—Article 27 says : “ Any person admitted to the Society “ who shall refuse to pay any assessment or other dues to the Society ”—of course, that term would apply to this \$10 for five years—“ or who “ shall neglect the same for the term of six months, after due notice is “ issued, shall cease to be a member.” Now, this proposed amendment provides for cases in which the members withdraw from membership. It also provides for cases in which parties are expelled from membership. But it makes no provision for cases where parties cease to be members by non-payment of the annual dues of \$10 for five years.

**Mr. J. P. DAVIS.**—If a party who has subscribed to the Constitution agrees to these conditions, he signs a contract. As far as I see, if he does not pay his dues he ceases to be a member.

**Mr. LOCKWOOD.**—It seems to me that these two cases are parallel. You have to take action in case of expulsion. You have to take action in case of a member who fails to pay dues. Could not the one claim this compounding money as well as the other ?

**The CHAIR.**—It is not intended so.

**Mr. LOCKWOOD.**—It seems to me that the cases are so clearly alike that one could do it as well as the other. I claim, however, that if I compound my dues and sign a contract to abide by the rules and regulations of the Society, and transgress them, so that I will have to be brought up before the Direction of the Society and be expelled, that I would have no legal claim for this money unless this clause is left as it is. I should be in favor of striking that out entirely. If my course of action and conduct was such as to require my expulsion, I ought to forfeit all claim to any moneys I paid in.

**Mr. J. P. DAVIS.**—I think there is a great difference in the two cases. In one case it is a voluntary action on the part of the member. He has agreed that if he does not pay his fees he will cease to be a member ; and he does not pay his fees. That is voluntary on his part. We assume, as a matter of fact, that the Board of Direction will see that the name will be dropped from the list. In the other case we have a trial ; he does something the Constitution provides for his not doing. He has been guilty of insulting talk, or something of that kind, we don't know what it may be. I think there is a vast difference between the two cases.

General G. S. GREENE.—I don't see any good reason for returning this \$250. I do not believe we are under any obligation to do it ; if a man signs an agreement to that effect, and if he is expelled, notwithstanding the lawyer's opinion, I do not believe we are under any obligation to do it. I don't believe he can have any claim against us after signing that agreement.

Mr. CROES.—Would it not be better, instead of separating withdrawal and expulsion, to make it, "In case of their ceasing to be members from any cause whatever, the amount paid would be the property of the Society."

Mr. SHINN.—It would be absolutely better. It is a well established legal principle that when you begin to specify you exclude everything not specified. If you do not do this you will have it in such a shape that everybody who does not voluntarily withdraw could take the money back.

Mr. CROES.—I shall move an amendment to the last clause. Perhaps the proposers of the original amendment may agree to that and let that go to ballot as amended. I offer this amendment, then, that the last paragraph of the proposed amendment to Article 22 shall be amended to read thus :

"Members compounding shall sign an agreement that they will be governed by the Constitution and By-laws of the Society as they are now formed, or as they may be hereafter altered, amended, or enlarged ; that in case of their ceasing to be members from any cause whatever, the amount theretofore paid by them for compounding and for entrance fees, and for annual dues, shall be the property of the Society."

Mr. SHINN.—I second that.

The CHAIR.—The question is open for discussion.

General G. S. GREENE.—Is there any objection to that in connection with the other articles ?

The SECRETARY.—Not that I see, sir.

Mr. SHINN.—I have no doubt whatever of the legal effect of an agreement of that kind. In the case that has been referred to, of the club, which is now pending in the courts, as I understand it, there was no agreement in regard to life membership. Life membership, of course, stated as a naked proposition, means life membership. It does not mean a membership at the pleasure of some committee of the Society. And that presents a very different question from what would be presented in case this amendment to the Constitution were adopted as now proposed, under which the party paying in this \$250 should sign an agreement to be bound by its conditions. I do not see anything in these conditions at all contrary to public policy, and any person is entirely competent to make any contract he pleases that is not contrary to public policy. Therefore I see no difficulty in that being made operative.

Mr. CROES.—The proper motion would be, in that case, that this

meeting recommends the adoption of the proposed amendment to Article 22, with the last clause amended as stated.

Mr. SHINN.—I suggest, Mr. President, that it is hardly time to come to that yet. We are now discussing the question of an amendment to the proposed amendment. We may adopt this and any other amendment after this is adopted. After all the amendments that are proposed to this original amendment have been considered and passed upon, then the question of the adoption of the amended amendment as a whole would be in order.

The CHAIR.—I will state that all this meeting can do is simply to approve an amendment. It will go to vote hereafter, and practically the whole action here is simply an approval, not a final adoption at all, but an approval to be sent out for ballot.

The SECRETARY.—It has been generally customary to recommend amendments.

The CHAIR.—Yes, and I understand recommendation to be equivalent to approval.

General G. S. GREENE.—The question is now on the adoption of that amendment?

The CHAIR.—Yes, sir. That has been moved and seconded.

The proposed amendment was then adopted.

Mr. SHINN.—I have another amendment to suggest. While it will be claimed that this fund to which the money received for compounding dues goes, is the general fund of the Society, there is practically no difference between the general fund and the Building Fund. There have been numerous contributions made by members to the Building Fund, and the amendment that I propose to offer relates to that. Add after the amendment, as it now reads:

“Any member who shall have heretofore paid \$250 or more into the Building Fund of the Society shall, at his request in writing, be credited with the same as in compounding of his annual dues; and any member who shall have heretofore paid into said fund a less sum than \$250 shall be allowed to compound his dues as provided in this section by paying the difference between the sum heretofore paid and \$250.”

The object in offering the amendment is to put those members who have voluntarily come forward and contributed to the Building Fund in as favorable a position as those members who have not come forward in that way. It does not necessarily follow that they will all take advantage of it; but they all may. The Secretary has made up a statement showing about the amount of money that would be involved in its adoption. He gives to me these figures: That six members have paid \$250 or over; that would amount to \$1 500. That would come out of the general fund; that is, the general fund would be lessened to that extent—in case they all accepted this provision. Fifty-five have paid \$100, making \$5 500. Seven have paid between \$100 and \$250, say \$150 each, making

\$1 050. And twenty-three have paid less than \$100, which, assuming the average to be \$50, gives \$1 150. Making, in all, about \$9 000 which would be involved, on which the annual interest, at five per cent., which is the basis of the Secretary's calculation in this matter, would be \$450.

It seems to me it would be nothing but justice to those members who have come forward and contributed to the Building Fund to give them the advantage, if they desire to take it, of this amendment to the Constitution. It is well known to the most of the members that this particular action on the part of the Board of Direction in submitting this amendment arose very largely out of what was said at the last annual meeting about contributions to the Building Fund; and it was an effort to produce a fund of sufficient amount to enable the mortgage to be canceled on the building whenever it was desirable to do so in the opinion of the Board of Direction. So that I offer that amendment for consideration.

Mr. J. P. DAVIS.—The proposed amendment says "any member who has paid \$250 for the Building Fund." Suppose he is a resident member; he has to pay \$300.

Mr. SHINN.—If he has paid \$250, that simply puts him in the position of anybody else now paying \$250.

The SECRETARY.—It says "shall at his request in writing be credited with the same as in compounding of his annual dues."

Mr. CROES.—Some members have kindly presented the Society with \$150 for the Fellowship Fund. Why should not they be credited in the same way as subscribers to the Building Fund? I do not think that the members who have contributed to the Building Fund ever did it with any idea of ultimate advantage in that way, and I do not believe that they desire it; and I do not think it is very complimentary to them to suppose that they would desire it.

Mr. SHINN.—They do not need to take advantage of it if they do not desire it.

Mr. J. P. DAVIS.—I wish to say further that we cannot afford it. That is the chief objection to it.

Mr. CROES.—That is a good objection, too.

The CHAIR.—The question is now properly before the Society upon this amendment as proposed. I would simply state that the sum mentioned, \$250, was the lowest that the Board of Direction could, in their view, place that proposed sum to be applied to the general fund. I merely state that for information.

The amendment was then, upon vote, not adopted.

The CHAIR.—Further discussion of the proposed amendment is in order. Are there any further amendments to the proposed amendment?

General G. S. GREENE.—I move that it be recommended for adoption to the Society by the annual meeting.

Mr. SHINN.—I second that.



The CHAIR.—It is moved and seconded that the amendment, as amended, be recommended by the annual meeting for adoption by the Society.

The motion was carried.

The CHAIR.—The next proposed amendment to the Constitution is in order for discussion or amendment.

Proposed amendment to Article XXXIII.

Amend Article XXXIII. so that it will read as follows:

Proposed amendments to this Constitution must be submitted in writing, signed by not less than five members, on or before the first Wednesday in November, and shall be sent by letter to the members of the Society at least twenty-five days previous to the annual meeting.

Such amendments shall be in order for discussion at such annual meeting, and may be amended in any manner pertinent to the original amendments by a majority vote of the annual meeting; and if so amended, shall be voted upon by letter-ballot in form as amended by the annual meeting; if not so amended, they shall be voted upon by letter-ballot as submitted; the vote to be counted at the first regular meeting in March.

An affirmative vote of two-thirds of all ballots cast shall be necessary to the adoption of any amendment.

Mr. CROES.—Article XXXIII. of the Constitution, as it now stands, reads:

ARTICLE XXXIII.—Proposed amendments to this Constitution must be submitted in writing, signed by not less than five members, on or before the first Wednesday in November, and then sent by letter to the several members of the Society at least twenty-five days previous to the annual meeting. Such amendments shall be in order for discussion and amendment at such annual meeting, and, with such amendments thereto as may have been approved by a majority vote of the annual meeting, shall be voted upon by letter-ballot, the vote to be counted at the first regular meeting in March. An affirmative vote of two-thirds of all ballots cast shall be necessary to secure the adoption of any amendment.

It was the object of the writer of this present provision in the Constitution, that its effect should be as is now proposed in the amendment. But the article is so worded that it was decided to be necessary to send out not only an amendment, as submitted to the annual meeting, but also such amendments to it as were approved by the annual meeting.

This proposed amendment obviates that difficulty, and sends out only one form, namely, the form which is approved, after discussion, at the annual meeting.

General G. S. GREENE.—I don't think the other meant anything different.

Mr. CROES.—That has been the ruling and the custom, so that this amendment is merely to return to what was intended by the member who drew up the present article.

General G. S. GREENE.—I move that that be recommended to the Society for adoption.

Mr. SHINN.—I second the motion.

The CHAIR.—The question is on the recommendation of this proposed amendment for adoption by the Society.

The proposed amendment of Article XXXIII. was then, by vote, recommended for adoption.

The CHAIR.—The next proposed amendment to the Constitution is in order for discussion or amendment. It is a proposed new article.

Proposed amendment:

A new article.

Whenever twenty or more members shall signify their desire to form a Section of this Society for the advancement of a special branch of Engineering, the Board of Direction shall consider such application, and submit it with an expression of opinion to the Society for a letter-ballot. The application shall be granted if two-thirds of the votes be in the affirmative.

Sections authorized as above shall have the privilege of separate meetings for reading of papers and discussions at times and places determined by themselves, but may not assume to transact business in the name of the Society.

The transactions of such sections shall be published by the Society under the usual regulations; but no expense other than for such publication shall be borne by the Society.

General G. S. GREENE.—It will be seen by this clause that the Board of Direction are required to publish any papers which may be read by these small sections of not less than twenty men. It would be really throwing into the hands of a few members the right to put into the proceedings anything they chose.

Mr. CROES.—It says, "under the usual regulations."

General G. S. GREENE.—Does that include submitting them to the Committee on Publication?

Mr. CROES.—Yes, sir. The usual regulations are as prescribed by Section 16 of the By-Laws, as follows:

Section 16.—When a paper is presented to the Society, the Secretary shall at once examine it, and report thereon to the Committee on Library, with reference to this standard: Papers containing old matter, readily found elsewhere, those specially meant to advocate personal interests, those carelessly prepared or controverting established facts, and those purely speculative or foreign to the purposes of the Society, should be rejected. The Committee shall then determine whether such paper may go before the Society. They can return it to the writer for correction and emendation, and call to their aid one or more members of special experience relating to the subject treated, either to advise on the paper or to discuss it. Such papers as in the judgment of the Committee should go before the Society shall promptly, upon their acceptance, be printed; others shall be recorded in books provided for the purpose. When, however, the Library Committee does not feel authorized to publish a paper, they may provide an abstract thereof, which, when approved by the author, may be published instead of the original paper.

I do not see that this formation of Sections in this very indefinite form is going to advance the purposes of the Society in any way. If there is anybody that can say anything in favor of it, I would like to hear it.

Mr. HAIGHT.—Some addition is needed to the amendment, I think. It seems very desirable that no course shall be pursued that will have a tendency to weaken this Society, or to detract from the interest felt in its meetings by members. It is inevitable that if Sections are formed in

the manner proposed, and they appoint meetings at the same time as the Annual Meetings or Conventions of this Society, it will have the effect of weakening the Society. Yet it might be done according to the wording of the amendment. It seems to me, also, that all papers for a Section need to be submitted to the Board of Direction as much as papers for a meeting. With regard to the times of meetings, the annual meeting of the County Surveyors' Association, of Indiana, was appointed to begin yesterday, and the annual meeting of the Ohio Institute of Mining Engineers will be held this evening. Members of either, who are also members of this Society, will be less likely to attend this meeting than they would be if the meetings of these bodies were at other times. It also appears detrimental to the interests of the Society for Sections to be established within resident limits, as no need for them within those limits seems evident. Any matters that would come before them can be with equal propriety introduced at the Society meetings, and be of interest to all. Beyond the resident limits, Sections formed for "the advancement of engineering" can introduce and discuss subjects relating to any of its branches, and thereby give to non-resident members of this Society advantages that are now possessed by residents only. By permitting all members of the Society to participate in the discussions of the subjects brought before any Section, the Society would seem to be strengthened rather than weakened by the formation of such Sections. The submission of all papers to the Board of Direction, and the reception of its approval before publication, will be as necessary for the meetings of Sections as for those of the Society. By publishing the papers in the Transactions, and transmitting them to all the members, with an announcement of the times and places of presentation, not less than twenty-five days before the time so announced for the papers to be read, a much more full discussion would seem probable than by the present plan, and the benefits of membership would probably be increased, and be more widely diffused. Non-resident members, and those unable to hear the reading of papers, will in this way be enabled to participate in the discussion, and the Society will inevitably be strengthened by the increased interest that will result in its transactions. Therefore, I submit this proposed amendment.

Mr. CROES (acting temporarily as Secretary).—Mr. Haight hands me this amendment. Proposed amendment by Mr. Stephen S. Haight: By adding to the proposed article of the Constitution, "No Section formed in accordance with this article shall have its place of meeting within 50 miles of the Post Office of the City of New York, nor shall any meeting of a Section be held at the same time as the Annual Meeting or Convention of this Society. All papers for the Society, or for a Section thereof formed in accordance with this article, shall be submitted to the Board of Direction, and if accepted shall, unless otherwise requested by the author, be published with the Transactions of the Society, and with an

announcement of the times and places of their presentation, to be transmitted to each member not less than 25 days before the times so announced. At the time so announced for the presentation of the papers, they shall be read by title only, unless otherwise desired by the writer, or ordered by a majority of the members present, and all members of the Society shall have a right to present written or verbal discussions of such papers at the places so announced for their presentation."

Also by erasing therefrom the words "of a special branch."

Mr. HAIGHT.—Yes, sir; I submit that.

The amendment was seconded by Mr. Van Winkle.

Mr. CROES.—The last clause of this is in conflict with the other provisions of the Constitution and By-Laws. It is unnecessary, for all that matter is provided for in the Constitution and By-Laws now. It is not germane to this question, or to this part of the Constitution. I would suggest that Mr. Haight withdraw that last part of it, while the first part would come in properly. The latter part of this proposition conflicts with other parts of the Constitution and By-laws. The first part of it is, that no Section shall be formed within fifty miles of New York.

General G. S. GREENE.—I still think that it is objectionable to have these proceedings (which are mentioned in this original amendment) published. It says here, "The transactions of such Sections shall be published by the Society"—the discussions of these separate Sections, which would increase our publication very much, and probably not very advantageously. There is no discretion in the Committee, as to publishing them, in our regulations; they are published on certificate of the Secretary of the Society.

Mr. CROES.—Papers for Transactions go before the Library Committee.

General G. S. GREENE.—It would require the Society to publish the transactions of these Sections.

Mr. CROES.—The objection that seems to me to be a strong one to this, is the manner in which the Sections are to be formed. Now, the object of this one was to form an association of river and harbor engineers; it was proposed by a number of gentlemen engaged on the Mississippi River, and this section was drawn up by Mr. McMath. And they have drawn up a constitution for a Society of River and Harbor Engineers, but proposed, before forming that Society actually, to submit this section to the Society, so that, as some of them were members of this Society—not all—they could work under the charter of the American Society of Civil Engineers, which would be the best way; and they would not form a separate society, and the American Society of Civil Engineers would publish their papers. Now, the river and harbor engineers are scattered pretty well over this country.

On motion, a recess for lunch was taken to half-past two.

The session of the Annual Meeting was resumed at 2:30 P.M.; Vice-President William H. Paine in the chair; John Bogart, Secretary.

The Secretary announced the programme of the excursions of the Society for the next day and for the reception in the evening.

The Report of the Committee on the Preservation of Timber was then presented.

## REPORT OF THE COMMITTEE ON THE PRESERVATION OF TIMBER.

*To the American Society of Civil Engineers:*

The Committee on the "Preservation of Timber" has collected a large mass of information.

This is so voluminous that the Committee has not yet had time to analyze it carefully and to write a report. It will do so as soon as the press of other engagements permits, and meanwhile asks the indulgence of the Society.

Respectfully submitted,

O. CHANUTE, *Chairman.*

B. M. HARROD,	} <i>Committee.</i>
G. BOUSCAREN,	
E. R. ANDREWS,	
E. W. BOWDITCH,	
G. H. MENDELL,	
C. SHALER SMITH,	
J. W. PUTNAM,	

On motion, the report was accepted, and the Committee continued.

The Secretary announced that Mr. F. W. Gilbert, C. E. of the Northern Pacific Railroad, was present, and desired, through the Secretary, to repeat the invitation that the next Convention should be held at Minneapolis or St. Paul. He presented for inspection of members a number of photographic views of scenery on the Northern Pacific Railroad.

The CHAIR.—We will now resume the discussion on the proposed amendment to the Constitution. The Secretary will please read it as proposed.

The proposed amendment was read, and also the amendment as offered by Mr. Haight (printed above).

Mr. COLLINGWOOD.—If any gentleman is present who can do so, will he be kind enough to explain the object of the original amendment? That has not yet been brought to the knowledge of the meeting.

Mr. CROES.—The Secretary is not here, I believe, at this moment. This amendment was accompanied by a letter from Mr. Robert E. McMath, Member of the Society, of St. Louis, who stated that it had been

intended to form a Society of River and Harbor Engineers. A constitution and by-laws had been drawn up, and many members had been secured, but as a great many of them are members of our Society, they desired to act in concert, not in opposition to the American Society of Civil Engineers; to establish this branch society, as it were, of the American Society of Civil Engineers, devoted to the discussion of the questions which especially interested these gentlemen, namely, river and harbor engineering; and, in order to accomplish that object, they desired the passage of a general law covering not only their case, but the case of any twenty or more gentlemen connected with the Society who desired to have an opportunity to discuss their own special branch of engineering at any time that they saw fit.

The SECRETARY.—I have here from Mr. Robert E. McMath a discussion of this proposed amendment, which he asks me to submit on account of the inability of himself or others of the proposers to be present.

Mr. R. E. McMATH (through the Secretary).—A statement of the origin of this amendment will, I think, furnish a strong argument for its adoption.

A number of engineers who were interested in a particular line of work and its related topics, proposed to form a special society. In canvassing the subject, it appeared that some, who were members of the American Society, proposed, if the suggested organization was formed, to terminate that membership. Others, not now members, seemed to think that all the real advantages of association would be realized in the special society. Thus it appeared that to form an independent organization would to some extent be contrary to the interests of the general society. Several of the promoters of the movement thought it well to avoid this danger, believing it practicable to effect all the ends desired by the proposed organization under the Constitution of the American Society, if the latter was so amended as to allow those specially interested in any branch of the profession to form sections or subdivisions. It also seemed probable that the desire for special facilities which actuated us would sooner or later lead others to similar action. We think it would be better to forego the presumed advantages of special organization rather than begin a process of disintegration, and we propose this new article as inaugurating a policy which will draw men into, and not from, the general society.

More general reasons may be added to the foregoing :

1. Recognition of sections would increase the interest of members and incite them to activity by bringing into closer contact those who have similar experience and studies. Attrition produces heat.
2. Papers presented through the medium of sections would probably be prepared with increased care, and discussions would doubtless be fuller than now. As a result, the value of the Transactions would be increased.

3. At Conventions, meeting by sections would enable more papers to be read and discussed, also would, by variety of programme, enable those in attendance to choose what they will hear. As a result, more will attend, for they will see prospect of gain in professional knowledge, each in his own line, and at the same time to enjoy the social features and visits to works and wonders, which properly form a large part of Convention programmes.

4. To these gains we may add that activity in the several lines will be an attraction that will draw the whole body of the profession to seek membership in some class, for they will find that they cannot afford to stay out; consequently, growth of the Society in numbers and influence.

Mr. HAIGHT.—I think that all of the advantages enumerated in these articles would be as well derived from the formation of sections according to the amendments that I have proposed, by striking out the words "of a special branch," letting any paper upon any branch of engineering come properly before such section. It would seem to be more consistent with the character of our Society to have it so that any members of the Society who are residents of the place of meeting of one of those sections, should properly be members of that section, and should be able to present any papers upon engineering subjects to that section, with all the advantages we should derive in that way, and without serious disadvantage. That might be advocated by those favoring the formation of such a section.

Mr. CROES.—I think there are a great many places in the United States where it would not be possible to form a section under the provisions of the amendment offered by Mr. McMath, but where it would be possible to form a separate society, which was open to the discussion of any subject. For that reason, if the proposed amendment of Mr. McMath is approved by this meeting, it would seem to me to be well to amend it by leaving out the special provision, as Mr. Haight recommended. I am not entirely clear as to the advisability of the sectional arrangement, at any rate.

Mr. SHINN.—The amendment, as then amended, would not prevent a section being formed relating only to a special branch. It would admit of that, or of a section covering all branches. I would like to ask the question, however, whether it is the design of the amendment to provide that only members of the American Society of Civil Engineers can become members of such section? The amendment, as drawn, seems to me to be a little doubtful on that point. It says that twenty or more members may form a section, but it is only by a remote implication that it conveys the idea that they may not afterwards take in members who were not members of the American Society of Civil Engineers; and that should either be provided for explicitly, or else it should be stated that the constitution should be subject to the approval of this Society. But I think

it would be better to state it explicitly—to be composed exclusively of members of the American Society of Civil Engineers.

That question, it may be remembered by a good many of the members, was very thoroughly discussed at the Louisville Convention, in 1873, under a resolution that had previously been offered, and the committee formed to consider it reported at that Convention on the subject of the formation of what were then called "chapters." That difficulty arose as to allowing these local societies to take in members who were not first made members of the American Society. It seems to me that, while this amendment is silent on that point, if it is approved at all, it ought to be approved in such form as would not leave that open to doubt.

Mr. NORTH.—I would like to ask the Chair if there is anything in the Constitution now that prevents members getting together and reading papers at any meeting?

The CHAIR.—There is nothing prohibiting it that I know of.

Mr. NORTH.—I don't know what more they want.

General G. S. GREENE.—They want it published in our Proceedings.

Mr. NORTH.—I understand any paper read before our Society is published.

Mr. J. P. DAVIS.—I should think from the letter of Mr. McMath that he intends to have others than members of this Society, members of the local society.

The SECRETARY.—I think, from a personal conversation with Mr. McMath, that he does not propose to have anybody members of these sections except members of the Society.

Mr. J. P. DAVIS.—In his letter he speaks of those who proposed forming societies not being members of our Society.

The SECRETARY.—What he said to me was that he knew that these members would immediately become members of this Society.

Mr. CROES.—Suppose they could not come in?

The SECRETARY.—Then they could not be members of that local society. We have invited men here who were not members. They cannot vote. They cannot call themselves members of the Society. We are exclusive, if we choose to be exclusive, but at many of the interesting discussions that we have had—even at the last discussion upon the paper which will be in order for discussion this afternoon—there were men here who were not members of our Society, who, by invitation of the presiding officer, took part in the discussions. We have published papers in our Transactions not by members of the Society. We have published discussions on technical papers by persons who are not members.

Mr. CROES.—Then what is the advantage of this proposed amendment? Has not everybody connected with the Society the same privilege now that he would have under this amendment?



Mr. J. P. DAVIS.—No ; the papers are to be read before the local society and then published here.

General G. S. GREENE.—I would like to ask a question. As I understand, this amendment is proposed to meet local interests, that is, engineers who cannot attend the meetings here, and who want to meet for discussion.

Mr. NORTH.—Is there anything in the Constitution that prevents twenty members of this Society, who may be residents at Chicago or St. Louis, from meeting, from listening to a paper, from discussing it, and then sending the paper here with this discussion and having it published in our Proceedings, under the usual restrictions ? That is what they propose to do. Why can't they do as they choose—send the paper here and let us publish it ?

The SECRETARY.—The only point in answer to that is : These gentlemen have been talking to me, and I feel it proper that I should, in a certain sense, represent them. The answer to that is what has been suggested just now by a gentleman in another part of the room. That is to say, papers to be published here are to be read here at meetings of the Society, or at the Conventions. Now, gentlemen who are interested in the improvements of the Mississippi River, which these particular gentlemen are specially interested in—the improvement of the rivers of the West—cannot come to New York for that purpose very well. They want to have discussion of papers upon their special lines of engineering, which discussions can be had there, at St. Louis, for instance, or other points, and where men who are immediately in the line of that sort of engineering can be present and take part. They have sent some of their papers to this Society ; they have been read at meetings of this Society ; they have been very little discussed. If they had been read before a number of engineers actively engaged in the improvement of the rivers of the West, they would have been actively discussed. Now, they say, we don't want to get out of the Society ; we don't want to form an organization to do it. But we feel this need ; discussing a thing a thousand miles off is a very difficult thing to do. Now, why don't you give us this sanction to go on, as a section of the Society, and discuss these questions ? Then we send them to you. Your Publication Committee takes them ; it is expressly provided that they shall be published only under the regulations of the Society. They claim that it will add to the interest of the publications of our Society if they can only have this privilege. And I mean to say that it is really a fact, that it is an earnest desire on the part of these men, that I feel is true, to increase the membership and usefulness and extent of this Society, rather than to fritter it away by a lot of small organizations. Whether they are right or not in their method of getting at it, is another question. But they do feel that they are interested in special lines of engineering, and that large numbers of engineers who are so interested cannot come to New

York to discuss these matters, and they say they would like to discuss these questions, and discuss them to a certain extent under the feeling that they are doing it as members of the American Society of Civil Engineers. In answer to the points suggested as to the methods of the English society, they say that it is a very different thing; the members of that Society can very easily come from any part of England to London, the capital; it is a short distance; but we cannot come from Chicago here; we cannot come from St. Louis here. They say they certainly have no intention to change the power of the Society in its general organization to control its own affairs in any way; they claim that absolutely. There is certainly an amount of credit to be given to their honesty in this matter. I do not think they want anything else. If they want to form a separate society, they can do it; but they say they don't want to, and we must give them the credit of honesty in the matter. It is decidedly a different thing from the suggestion made two or three years ago, which was discussed so largely and which was not carried, to form Chapters of the Society. And then the question was, how was it possible to form Chapters of the Society which should not have the power of admitting members, and yet which should keep successful? The Society made up its mind at that time that it could not be done. It was earnestly discussed, but on the whole it was decided there was no way to do it. Now, they particularly say they don't want to have the slightest privilege in regard to the admission of members. All they want is the power to go on, under the direction of the Society, to meet together and discuss these questions. It is true that they can do that this moment, but then they won't be doing it at all as of this Society. If they send their papers here, if they do that, then the answer would be, why you read this paper previously before a lot of people; it is not new, because it was not originally presented to this Society. That is all.

General G. S. GREENE.—They propose more than really asking that their papers be recorded here. They ask their transactions, which they cannot do under the present organization. Their transactions, of course, include their debates and discussions, which may be very extensive, and all I propose is, that the publication of these transactions shall be subject to the approval of the Direction. I propose to make an amendment to that effect.

Mr. COOPER.—I think that in this discussion of this question of sections, two things are to be considered—the section by locality and the section by specialties. Forming a section for the discussion of harbor and river improvements is entirely a different thing from forming a section to have it at St. Louis or New Orleans, or any other point. They are two different things. I believe thoroughly in both of them—both in sections by localities and in sections by specialties. But to discuss the matter thoroughly it seems to me we should keep each of them separately in view. By local sections,

the members of our Society have the opportunity of coming together and thoroughly discussing any subject they desire. They should have the right also of admitting as many members of that section as they please, regardless of being members of our Society. Such admission does not give them any rights in our Society, but simply gives them the right in the section to discuss any papers that come before that section, we, as a Society, getting the benefit of that discussion. That is part of the object of our Society—to get information from all parts, from every person. We would get the benefit of that. Such members would have no rights in the American Society of Civil Engineers. They would not even be entitled to our publications, but we would get the benefit of their being members of these sections. In addition, a section by specialties would have great advantages, because any subject of a particular character would be brought before the men who are competent, or supposed to be competent, to discuss that matter, instead of throwing it open for a general discussion, which frequently crowds out the very ones who should discuss the subject. Now it seems to me, in discussing this subject, we should consider whether this is a proposition for sections by location, or sections by subjects.

**THE CHAIR.**—The proposed amendment which we are now speaking of, seems to change it.

**MR. COOPER.**—The amendment as originally proposed, as I read it, simply divides the Society into sections by special subjects. It has nothing to do with locality, but Mr. Haight's amendment changed the character altogether, and makes it sections by location. That is the vital point, it seems to me, in the whole subject.

**MR. EGGLESTON.**—It is true, as has been said by the Secretary, that this country is greater than any other country in the world, on account of its greater extent. In older countries you can get access to the capital in a few hours. It is very clear that members of this Society, if they were members in San Francisco, ought to be allowed to discuss the engineering points which are of interest there; they ought to be allowed not only to read papers, but to discuss the matter, and then, when that has been done, that discussion and these papers could easily be sent here and be read by title and be part of the discussion of the Society. If you cut off a member in San Francisco from hearing it discussed by members in the vicinity, and who know most of the details, and require him to read it here, where there may be no discussion on it at all, it seems to me you cut off a great deal of useful knowledge. I think by a very simple amendment—I am not prepared to offer it—if we allow members to go on and discuss subjects to them locally interesting, and then have the paper forwarded here and read by title, you would have accomplished all that is desired in both these amendments.

**MR. CROES.**—There are a great many papers published already which are never read. The majority of the papers published, I might almost

say, are not read in full at the meetings, so that there is nothing to be gained by making any more written law on the subject.

Mr. EGGLESTON.—The discussion of the paper is often very much more interesting than the paper itself.

Mr. CROES.—Very much more.

Mr. J. P. DAVIS.—Do you submit papers to be read in the Society which have been read elsewhere?

Mr. CROES.—No, sir.

Mr. J. P. DAVIS.—Then, that is the point. They want to read their papers elsewhere, and send them here to be published.

Mr. CROES.—Papers that have been read before other societies, and not published elsewhere, could be published here perfectly well. The important point in the thing is, as I understand it, that we demand priority of publication of any papers presented to the Society. If these local sections are to have the papers reported in the local press and published in the papers there, that would be a publication in advance, which would render it ineligible for publication by our Society. The same point I take with regard to the publication complete of papers that are read here and might be given to a local paper to publish before publication by the Society. As a member or chairman of the Library Committee, I should vote always against the publication by the Society of any paper in such a case.

Mr. COLLINGWOOD.—When this matter, in a little different form, was up before us five or six years ago, I was then opposed to the action. Since that time I think circumstances have changed very materially; we are now in a stronger position than we were then, and we can afford to be more liberal. We do know that some of these local societies that have been formed since then, are doing a good work; and that some of the papers they are publishing, are ones we would be glad to have in our Proceedings. It seems to me we should endeavor to secure for our publication that class of papers which have been read elsewhere, some of them exceedingly good. In my mind it is very desirable to do it. I do not know what is the best way exactly. We might not hit on the best way first, but certainly it is a good idea to make an entering wedge, and see what can be done hereafter.

Mr. BOLLER.—It is a good thing for this Society to take a broad and liberal view of this matter. Most old members will remember the time when we had our old quarters in William Street. The great difficulty was to make the members take a broad American idea of the Society, and the Society was growing fast to be simply a local New York Society. Every effort was made in all sorts of ways to interest the members beyond the influence of New York; a great many resignations came in; they said they knew nothing about the Society, they got no benefit from it, and finally the idea of the peripatetic annual conventions was settled upon. And from that day the Society has become what it is. The whole

strength of the Society has arisen from the idea of making the interest of the engineers of the country a common one. And that was done by moving from point to point once a year, and getting together and developing the social idea and exchanging scientific information. It was absolutely necessary on account of the vast differences in points of habitation, and the importance of engineers coming together.

This sectional idea is another step in the same direction, and the general principle of it I am in full sympathy with. I do not see exactly that the amendment proposed covers just what we want to do, but I believe it is on the right line, and from the material we have in hand in the original proposition and the amendment and discussion, I think that an efficient working amendment can be framed to meet the needs of all those gentlemen that are at a distance from New York, and still closer bind the Society all over the country, and make it more national even than it is now. I think, probably, the best plan would be to appoint a committee to take this material and see if they can draft a series of resolutions or draft an amendment that would meet the objections that have been urged—and there are objections in the present crude form—and present to the Society in the course of fifteen or twenty minutes—I think it can be done—an amendment that will meet the views of all parties in reference to this, and have the section idea worked up in the direction that is proposed. I move, therefore, that these amendments and original proposition be referred to a committee, to report within fifteen or twenty minutes to the Society a complete amendment for consideration. I think no objections can be made, and then we can get through it a great deal quicker.

Mr. SHINN.—I second that motion.

The CHAIR.—How many do you ask on the committee?

Mr. BOLLER.—A committee of five.

The CHAIR.—It is moved and seconded that this matter be referred to a committee of five, to report before we adjourn.

The motion being put to the vote, was unanimously carried.

The CHAIR.—I appoint as such committee: Messrs. Boller, W. W. Walker, Macdonald, Cooper and Charles H. Fisher.

(This committee then retired.)

The CHAIR.—The present condition of the subject of Tests of Structural Materials was referred to in the report of the Board of Direction. That subject is, by request, now open for discussion.

Mr. MICHAELIS.—I only want to say a very few words on this matter, and that simply in a practical direction. You may, perhaps, recollect the circumstances under which the present law was passed. It was at the Convention in Washington, at a time when the Society felt itself really pledged to a bill that at that time appeared to have a fair prospect of being passed. In the hurry of the session, however, that bill was not favorably reached. There was, however, a feeling that something ought

to be done at once to bring about this so much desired end—the use of the Government machine at Watertown Arsenal—in the interest of the profession. The official representatives of the Society at that time felt that they could take no official action in the matter, inasmuch as they were pledged with the other societies to a certain course of action, namely: the support of the bill which was then before Congress. But I believe most of them felt that as individuals they could do what to them seemed best for the benefit of the Society and the profession. Accordingly, at the closing hours of the session, while the Army Appropriation Bill was in controversy, the present provisions of law were added by the efforts of the members of the Society who were then in Washington, aided by certain Government officials. The law as it stands now gives national recognition to the American Society of Civil Engineers, and that is a permanent law; also provides that any programme of test which they may submit shall be duly carried out. That is the law as it stands. That year the appropriation was ten thousand dollars, which had been the usual appropriation for several years, and I believe had always been expended in what was then the legal work of the machine, and I presume has been no more than was needed. In fact, there was always more asked, but it was not obtained. Now a new duty is devolved by law upon the machine. The Board of Direction have done their part very satisfactorily. They have proposed a programme, and I understand the proper Government officials have been communicated with, and I believe that will be carried out so far as the means at hand will permit. The Society has been given, by law, certain privileges. The law, however, has not provided any means for carrying out the Society's programme, and I believe that it is our business to attempt to provide the necessary appropriation to carry out any programme that we may have submitted, or that we may hereafter submit. The present Army Bill, in which this matter is legislated upon, contains the same provision that it has always contained, namely: it appropriates ten thousand dollars for the care and preservation of the machine, and for the tests of structural materials. Now remember that this appropriation of ten thousand dollars is not a specific appropriation to carry out the programme that the Society submits, but it is intended to cover all expenses of the machine, including whatever tests the Government may require. But no special provision is made for this new work that has been imposed upon the machine. The present Congress becomes *functus officio* on the fourth day of March next, and the next appropriation will stand until the 30th July, 1884. The next Congress in its long session meets in December, 1883, and judging by the past, appropriation bills will not be reached until the following June. That brings it to June, 1884. So that you see, if any money is required to carry out the provisions, it must be obtained now, for otherwise a space of eighteen months will pass without any appropriation being available. I would

suggest, from the experience of the past, that any reasonable amount of money that the Society may deem necessary to carry out its programme can be obtained from Congress, and I think it is our business to obtain it. I would suggest that the Society appoint a committee, and for reasons that are probably known to all of you I do not propose to make that motion, but I think it would be well to appoint a committee whose business it shall be to appear before the Appropriation Committee of the Senate, or probably the Conference Committee, who shall ask for an appropriation for what we require, namely: the carrying out of the programme which this Society may submit. I think it is very feasible to do this. This is a very economical Congress just at present, and no appropriations are made that are not in strict accordance with the law. This year we are in a different position from the last. Last year any legislation we asked to have engrafted in appropriation bills was subject to the point of order that it was not in accordance with law. Now, however, if an appropriation of five, ten, fifteen or twenty thousand dollars—whatever the Society should deem proper—should be put in the bill, and one of the well-known objectors in the House or Senate should raise the point of order, that there was no law for this, the supporters of the bill could well point to the law, that is on the statute at present, that it is made the duty of the proper Government official to carry out the programme that may be submitted by the American Society of Civil Engineers, and that this money is needed to carry out the law. I think I have made the matter plain. I think it requires very little work, and the work that the Society expects from the carrying out of its programme will really be jeopardized unless the necessary funds be obtained.

I submit that a committee be named, whose influence will be stronger and more potent than the individual members who appeared last summer, and who obtained the legislation—a committee who can state that they represent the body of the American Society of Civil Engineers, which Society is now recognized by the national law. And that is the reason I suggest that a committee be appointed who can speak in the name of the Society, and tell the gentlemen in Congress that the Society wants this money.

Mr. EGGLESTON.—I think it is the duty of this Society now to follow up the idea suggested by Captain Michaelis, and that was part of the original programme of the Conference Committee in Washington. As Captain Michaelis does not desire to do so, I therefore make a motion that a committee be appointed to act for the Society in this matter.

Mr. J. P. DAVIS.—Ought not that motion to be a little more complete, specifying the number, and when they shall be appointed?

Mr. MICHAELIS.—I mean immediately.

The CHAIR.—I wish the mover of that motion would suggest how many he wants.

Mr. EGLESTON.—A committee of seven I suggest should be appointed, and that the committee, if necessary, be appointed by the Board of Direction within as short a time as would be convenient.

Mr. MICHAELIS.—The bill is now in the Senate, and it is very necessary whatever is to be done should be done quickly. I do not think we have over two weeks to do the work in. The bill has passed the House without any special appropriation for this purpose. It is now in the hands of the Appropriation Committee of the Senate.

Mr. EGLESTON.—It was suggested that the committee be appointed by the Chair as soon as practical. I think it would be better, perhaps, for the Board of Direction to discuss the matter, to find out who the members are that would be most likely to have the most influence in Washington.

The CHAIR.—I like the suggestion that the Board of Direction should make the appointments, because I think the subject of canvassing who could best go to Washington, and who personally had the most influence at Washington, would require some little time. I like that form best.

The SECRETARY.—The Board of Direction will, by law, have to meet within a week, and I suppose that action can be taken immediately.

The CHAIR.—It is moved and seconded, then, that a committee be appointed by the Board of Direction, consisting of seven, to attend to this matter.

On being put to a vote, the motion was carried.

The CHAIR.—General business is now in order. Members are requested to present any desired business. None being presented, the discussion upon the paper by William P. Shinn, M. Am. Soc. C. E., on "The Increased Efficiency of Railways for the Transportation of Freight," will be in order.

A discussion of this paper by Mr. John B. Jervis, Hon. M. Am. Soc. C. E., was then read by the Secretary.

The committee to report upon the proposed amendment to the Constitution then presented its report through the Chairman, Mr. Boller, as follows :

The committee, to whom was referred the original amendment of the Constitution, with its various amendments, would respectfully report as follows : That they have unanimously and heartily agreed upon the following amendment, and they have done so with as catholic a spirit as possible to advance the interests of the Society, and to protect the Society in all needful ways in its composition, control and dignity. The amendment they propose is simply a small change on that originally proposed, namely, that the proposed amendment should read as follows:

Proposed amendment.

A new Article:

Whenever ten or more members of the Society shall signify their desire to form a Section of this Society for the advancement of Engineering or of any special branch thereof, the Board



of Direction shall consider such application, and submit it with an expression of opinion to the Society for a letter-ballot. The application shall be granted if two-thirds of the votes be in the affirmative.

Sections authorized as above shall have the privilege of separate meetings for reading of papers and discussions at times and places determined by themselves, but may not assume to transact business in the name of the Society.

The transactions of such Sections may be published by the Society under the usual regulations; but no expense other than for such publication shall be borne by the Society.

Mr. SHINN.—I move that the report be accepted, and that the committee be discharged.

Mr. COOPER.—I second the motion.

The motion was adopted.

General G. S. GREENE.—I move that the amendment as reported be recommended by the Annual Meeting for adoption by the Society.

Mr. SHINN.—I second that. In seconding that motion, Mr. President, I wish to endorse what Mr. Boller has so well said in regard to broadening instead of any possible narrowing of the foundations of this Society. The important change that he referred to in his historical remarks, of adopting peripatetic conventions, undoubtedly laid the foundation for the present prosperity of the Society. Many of the members will remember that in 1873 we came to another point where there was some departure necessary, and it was only obtained after a very considerable struggle. The questions then of admitting non-resident members to a voice in the proceedings of the Society by means of the letter-ballot, and the question of a monthly publication of the transactions instead of an uncertain—

Mr. BOLLER.—Spasmodic.

Mr. SHINN.—A publication so uncertain and irregular that we never knew whether we would receive two or three papers a month or one in three months, came up for discussion, and were very warmly discussed and finally adopted.

I knew at that time the feeling of the non-resident members on these two subjects. They felt as though they were excluded by the necessities of their situation from personally participating in the meetings that were held in New York twice a month, and many of them, by their remoteness from the place that might be selected from time to time for the Annual Convention, were prevented from even attending that, except at rare intervals. The number of members that we had in attendance at the conventions was rarely over fifty or sixty out of a membership at that time of some three hundred, showing that a very large proportion of the members was not able even to get to the conventions. The feeling was that the Society, if it was to be made national, should be so broadened in its views, in its aims, and in its efforts as to include those members that necessarily resided at a great distance from the City of New York.

There has been another particular in which it has always seemed to

me the policy of the Society has been narrow, and I think the time has come now to broaden that—the question of the publication of these papers. It was for a long time held that no periodical, newspaper or other publication should be allowed to publish the papers of the Society. They were copyrighted; they might be quoted from; they might publish portions of them; but the papers themselves were copyrighted, and could not be published as a whole in any other publication. Now, engineers, as well as other people, need to get their wares before the public; their wares are frequently their views—their ideas; and as human nature is very much the same everywhere, and very much the same in all the walks of life, the experiences that others have had in getting their wares before the public are certainly not to be ignored by the Society. I recollect when the remark was made, that if we allow these papers to be published in other publications there would be no inducement for people to become members. Now, as astute a man as Barnum has found it to his advantage to parade his animals and his human beings all through the town where he was going to show; he did not hide them and say, “You shan’t see one of these animals, or one of these people, until you come within the walls of my tent.” He has found it to be an advantage to show them, and to let the people see he had something worth showing. He has found that by that means he has increased the attendance at the show. Now, that lesson ought not to be lost in this Society. In the Institute of Mining Engineers we had the same question up a while ago. At that time they had a publication, and a very good publication—a publication of very high standing—that was allowed to publish exclusively the papers that were read before the Institute of Mining Engineers; and the question came up whether it would not be best to allow other publications to spread those papers before the community, and it was decided that it would be best, and now there is no restriction. Papers that are read before the Institute of Mining Engineers are allowed to be published in any paper that has the enterprise to get hold of them and set them up in type. What is the result? The Institute of Mining Engineers is the strongest society that has any professional leanings, probably, or, perhaps, the next strongest, in the United States to-day. It numbers something over one thousand members, and that membership has increased very rapidly. The interest in the Institute has been very rapidly developed since the papers have been allowed to be published all over the country.

The amendment that we have before us to-day is in the direction of broadening the foundations and extending the uses of this Society; and, in my opinion, it ought to be adopted. The amendments that the committee have made, I think, improve it over the form in which it was originally submitted. As I understand the form in which the committee recommended it, a section may be formed for any purpose; it may be devoted exclusively to one branch of engineering, or it may take in all

branches. The result will undoubtedly be to increase the interest that is felt in this Society, in the papers that are read before it, and in the discussions that take place in it. Many of those members who never get to a meeting of the Society will be enabled to discuss papers, which will afterwards be sent here. It will lead to free discussion, and increase the sum of human knowledge upon the subjects that this Society takes cognizance of, and it seems to me that that is what we are here for.

Mr. BOLLER.—It may be a little irreverent, but I want to criticise one remark of Mr. Shinn, made in regard to the Institute of Mining Engineers being the most flourishing society in this country. It is a flourishing society, but this American Society of Civil Engineers is the only society I know of that has a qualification for membership. I am a member of the Institute of Mining Engineers. I don't know why, but I suppose because I was proposed and elected. I know nothing about mining, and if the method of electing members in that society was the same as it is here I would not be eligible for membership. So that, in my way of thinking, I consider the present membership of the American Society of Civil Engineers, its qualifications for membership, and the method of investigation of parties applying for membership, puts it, *par excellence*, over all societies. I only rise to make the antithesis to the form of what Mr. Shinn said in regard to the Institute of Mining Engineers.

Mr. SHINN.—I did not wish to be understood as making any comparison between the Institute of Mining Engineers and this Society whatever. I referred merely to the growth of the Society as stimulated by a certain policy, and that Society five years ago was weaker than this in point of numbers, and at this time it numbers not quite double, but I think the membership is very nearly up to eleven hundred. That was the only point I wished to call attention to—that that Society had found it to its interest to adopt a liberal policy in regard to this matter of publishing its papers, and I think that this Society would not suffer from a similar broadening of its foundation and of its methods.

Professor DE VOLSON WOOD.—I would like, if I had time to study the question, to say some words particularly in regard to this question of publication. My first impressions in regard to this proposition were unfavorable, but I cannot speak very sharply or positively in regard to it, because I have not got the full import of it. I have not looked at it as other members have. I will only indicate very briefly how it impresses me. It looks first rather like a disintegration than otherwise. I do not see the necessity of the permit. I do not see what is to prevent them, or a dozen persons anywhere, forming a society and discussing a paper, either here or elsewhere. But as these opinions may have been well considered, and properly, and my impressions improperly founded, I will say no more than throw them out. But it gives me an opportunity to bring forward an item that I would have brought forward when the

Chairman asked for miscellaneous business if I had not been a very timid man, so I will bring it up under this head. It has occurred to me that possibly this Society could spread its benefits wider, and be a greater impetus to its members, if it could publish the titles of scientific papers that are being prepared and read and discussed by other societies. I had thought at one time of either presenting a resolution, or of asking a question of the Board of Direction to this effect: That the Board of Direction be requested to consider, and if proper submit to us, the question whether we might not publish with our Proceedings the titles of papers that are published by other societies. There are local societies existing here and there, and if this measure that is now proposed should succeed in swallowing those up and thereby directing the papers to us as headquarters, then my former impressions will be of no account, and you will secure the thing I am now aiming at. It would require considerable labor on the part of somebody to look up these societies and to secure the titles of the papers. But it seems to me that we ought to have, if possible, somewhere in this country an office or society which would at least publish the titles of papers and tell where they may be found. I do not think that we are in condition at this time to publish abstracts of these papers; but if a paper is read upon Bridge Engineering, and a man is investigating that subject, and he finds a title, he will look it up and see what is in the paper for his benefit. So with hydraulics. So with general science, or any subject you may please to mention. So that by this matter of securing the titles of papers at least, and if possible, beyond that, an abstract of the substance, for this Society, I think a great good would be done by it. And it would be a great pleasure to me if I could be assured that this Society was strong enough that it would secure extra help to attend to this one thing. It would make them useful to ourselves and others to a greater extent than is being done at the present time.

The CHAIR.—The question is on the recommendation of the amendment as amended. Will the Secretary read it again, so that it may be fully understood?

The Secretary did as requested.

Mr. NORTH.—After being read before this section are they to be published without being submitted to the Society?

Mr. COOPER.—The presentation of a paper by a section is nothing more than the presentation of that paper by a single member. The only difference is, that if Mr. North desires to call fifteen of his friends to discuss the paper, they have the privilege of doing so; but when it comes into the Society it comes into the Society presented by Mr. North, accompanied by the discussions of his fifteen friends, if he wishes to attach them to it. In regard to the remarks of Prof. Wood, I will say that he certainly does not appreciate the labor, or he would not object to the division of this Society into sections. We are now past 500 members, and

we cannot get more than 60 or 80 members at a meeting, and when we get 80 members we find ourselves so unwieldy that we cannot use our time with satisfaction.

Prof. WOOD.—I think the gentleman misunderstood me in that regard. I believe I do regard the opinions of three men interested in a subject, brought together to discuss it, pertaining to the interests of those three, worth more than the whole Society, oftentimes. But the thing which struck me was—I do not intend to take up time—was the matter of taking into consideration the formal organization under, or within, or around, or about, in some way, of such societies.

The CHAIR.—The question is called for. The question is upon the recommendation by the annual meeting for adoption by the Society of the proposed amendment to the Constitution as reported by the Committee.

On a vote, it was so recommended.

The SECRETARY.—I wish to ask for information. That is to say, whether this proposed section has now been amended in such an essential way as to make it necessary, under the Constitution, to submit it in its original form, and also as amended. It was determined some time ago that if amendments which were of an important character, so as to change the substance of the amendment, were made by the annual meeting, then both the original form and the new form should be presented; but if they were merely verbal changes, then it was not necessary.

Mr. MICHAELIS.—The spirit of the amendment is not altered.

Mr J. P. DAVIS.—The Constitution provides how it should be carried out, and the Board of Direction and the Secretary are to follow the Constitution.

The SECRETARY.—All right.

Prof. DE VOLSON WOOD.—I have a resolution to offer. It is this:

*“Resolved, That the Board of Direction be and hereby are requested to consider the propriety of publishing in their regular publication the titles of Engineering Papers read by other societies or elsewhere published, and if considered advisable, to prepare a plan therefor.”*

Mr. COOPER.—I am very sorry to differ from my friend, Professor Wood. Merely publishing the titles of papers I do not think would be of any use to any member of this Society. We know very well it is very easy to give a big sounding title to a very thin article. Unless that title is accompanied by an abstract of the article, I do not see how it could be of any use to the members. The moment we can publish the title of an article and give an abstract of it, so that each member could know what the article was, in my opinion it would be very useful. If only the title is published, we are just as ignorant as we are if we see a catalogue of books, none of which we ever saw or examined. If Professor Wood, or

some other gentleman, will undertake to give us abstracts of papers published by other societies, I think it would be a very good thing as soon as we can afford to do so.

Mr. EGLESTON.—I would move to amend—"That abstracts of such papers be attached." I beg to state for the information of this discussion—which I think is somewhat out of order—that the German Government is in the habit of publishing papers in all languages, and we can be saved from publishing these if we will only write to the Minister of the Interior at Berlin.

The CHAIR.—I desire to call up the question of the mode of submission of the proposed amendments to the Constitution. I had supposed that the amended form of the last amendment considered, as reported by a committee of five and approved by this meeting, had entirely taken the place of the original amendment, and I considered the subject thus disposed of. I find there is a difference of opinion. The Secretary thinks he is called upon to send out for ballot both the original proposed amendment and also the amendment as modified by this meeting. If that is the case then I am in error in my ruling; and I hope that the Society will now pass upon this point before entertaining another motion. As I say, I have taken upon myself to pass upon a point perhaps that I had no right to pass upon so arbitrarily, and I would now ask that the Secretary be instructed in regard to the point that he raised a few moments since, and then we will pass to the other business in regular order.

Mr. BOLLER.—I move that the amendment as passed shall be the only one sent out for letter-ballots.

Mr. EMERY.—There is a question back of that. This is an amendment to an original proposition. I think it probably would be better to move that this be put in as a substitute for the original and published as such.

Mr. J. P. DAVIS.—The Constitution provides how we shall issue this letter-ballot, and I do not see how you can avoid it. I do not see that any view of this meeting can change any article of the Constitution. In other words, we had better put both out—the original and the amendment to the amendment; and one of the amendments that has been passed upon already is to so amend the Constitution that we shall not have to do it after this year. But I do not see, if this meeting takes a vote, how it is to modify our action in the matter at all.

Mr. COOPER.—In previous years we have done as Mr. Davis has stated—we have sent out both amendments, but we have always accompanied the first or original amendment with the statement that it was not approved by the annual meeting. The second one has been recommended by the annual meeting. I do not think the Secretary can refer to an instance where the annual meeting has recommended one of two amendments for adoption, but that the Society has endorsed the action of

the annual meeting. I think the best way is to send out the first as not recommended for adoption, and the second as recommended for adoption by the Society at large. I think with that there will be no question but that it will meet with the approval of the whole Society.

Mr. SHINN.—Mr. Cooper is wrong in his history. I offered the amended article, which is now the 33d article of the Constitution. It was written by me. The language was well considered, and in my opinion it accomplished the object intended. In the opinion of the Board of Direction it did not. There was the point at issue. The first amendment that came up that was sent out in that dual form—the only one, so far as I now recollect—was an amendment in regard to the election of members, in which I, with others, offered an amendment to the Constitution providing that members should be elected thus and so. I was not present at the annual meeting that considered that amendment. The annual meeting saw proper, as they had a right to do, to change that amendment. Without changing its object or its general spirit, they changed its details; and so the Secretary, under the instructions of the Board of Direction, sent that amendment out in two forms. Now, there was a majority of the Society—a majority of those who voted on the amendment—who wanted to have that amendment adopted; but a portion of that majority voted for it as myself and others originally submitted it, and another portion voted for it as the annual meeting amended it. And the consequence was, that although a majority vote was cast in favor of an amendment, there was no amendment. The same result was only prevented last year by a personal appeal to the members not to change verbally some amendment that was up for discussion in this same way, as it was feared that it would lead to this falling between two stools as before. Now, then, to come to the question that is really at issue in this matter. Mr. Emery, in his remarks, evidently did not know the history of that. This is not a question of mere parliamentary form, as to whether the committee's report shall be considered as a substitute, or as an amendment to the amendment, or anything of that sort. The question is simply this: Five gentlemen have offered an amendment here providing for the establishment of sections; that amendment, as offered, does not meet the approval of this annual meeting; a committee of this annual meeting have revised that resolution by altering its details, not its spirit; and this annual meeting has unanimously approved of the revised form of the amendment. Now, under the previous ruling of the Board of Direction, the Secretary must send out the original amendment as submitted by Mr. McMath; he must also send out the revised amendment as submitted by the Committee, and of course he will say that the first was not approved by the annual meeting, and that the second was approved by the annual meeting. In most cases that would be sufficient to secure a majority of all the votes for the amendment which was approved by the annual meeting. But

Mr. McMath and his associates may prefer the amendment in the form in which they originally offered it (as I and my friends and a good many others did the amendment I offered at another meeting), and they might vote for it in that way. And if we assume figures—if there were 300 votes cast, it would take 200 necessarily to adopt any amendment. Now, there might be 149 votes cast for one of these amendments and there might be 151 cast for the other, and they would not, either one of them, be adopted. Now, then, Mr. Davis has said that this meeting has no authority to construe the Constitution. I believe that this meeting has as much authority to construe the Constitution as the Board of Direction has. The Board of Direction have said, in their decision in regard to the provision, "Such amendments shall be in order for discussion and amendment at such annual meeting, and that such amendments thereto as may have been approved by a majority vote of the annual meeting shall be voted upon by letter-ballot." The Board of Direction, in its wisdom, has said that that means that the amendment shall be sent out as originally submitted; that it shall also be sent out as amended. Now, I submit, it does not mean any such thing. You will find in any record that you may take up of legislative proceedings this expression: "The bill passed with the amendments." Will any gentleman say that that bill passed as it was originally submitted, and that it was also passed as it was amended? No gentleman would pretend to say any such thing; and, not to mean any disrespect to the Board of Direction, to my mind the construction they place upon this amendment has always been absurd. I never could see any grounds for it. If it was to be taken literally at all in the way they express it, it would mean that the amendment was to be sent out as it was originally proposed, and then each of the amendments that was specifically adopted to it should be sent out also. But evidently it does not mean that. If it means anything, it means that this meeting has a right to amend the amendment, and that the amended amendment goes out for letter-ballot. That was the intention of it, and I believe that this meeting has as good a right to say whether that is the meaning of it as the Board of Direction has.

Mr. J. P. DAVIS.—If I understand the gentleman, he says that the original amendment should be sent out as amended instead of with the amendments. He says the Board of Direction must be instructed in that way. It is not a question whether we can be instructed or not; we are the executive officers of the Society, and are obliged to construe the Constitution ourselves. We cannot be instructed. I say the Board cannot be instructed as to how these amendments shall be sent out. We are to construe the Constitution ourselves. We are executive officers of the Society.

Prof. DE VOLSON WOOD.—What is the question before the house, Mr. Chairman?



Mr. BOLLER.—I offered a resolution that only the amendment as recommended by this annual meeting should be recommended for balloting.

The CHAIR.—The motion was made by Mr. Boller on the request of the Secretary to receive instructions in regard to how he ought to send out this motion, and his motion was that only the proposed amendment as amended be sent out.

The SECRETARY.—Pardon me, Mr. President ; I did not request Mr. Boller to do so at all.

The CHAIR.—In my opinion, it seems to me that the Society here have a right to construe this case, where, I suppose, the amendment as amended was almost identical with the original amendment—so near as not to require the sending out of both. That was the only point at issue, which Mr. Boller attempted to cover by his amendment or resolution.

Mr. COOPER.—Mr. Davis took the ground that the Board could not be instructed as to their interpretation of the Constitution. I think he is perfectly correct. All that we can do is to discuss it and make them change their mind. They are the executive officers of the Society. I really think we can take no action in the Society.

Mr. BOLLER.—My attention has been called to a serious omission—that we passed an amendment to the amendment as proposed. Now we have got to pass the amendment as amended.

The SECRETARY.—Oh, no. This meeting, if it chooses, can amend a proposed amendment to the Constitution, and it can recommend anything it chooses to the Society for adoption. We cannot adopt the amendment. It must be adopted by letter-ballot. The Society votes on this by letter-ballot by and by. There is no question of the adoption of an amendment here. This meeting has already amended that proposed amendment. The report of the committee was accepted ; then, on motion, the proposed amendment to the Constitution was amended as recommended by the committee. Then, on motion, it was recommended to the Society that that amended amendment as proposed by the committee should be recommended to the Society for adoption. We cannot adopt anything here.

Mr. MICHAELIS.—I think if the matter becomes clear to me, as I perhaps have an average understanding, it may be clear to others. I understand the point of the Secretary—that we simply give the weight of our approval. Now, if you answer this question, I think I will understand it. Have I the right, as a member of this Society, who proposes an amendment to the Constitution in accordance with its provisions, have I the individual right to demand an expression of the Society upon my proposed amendment ? If I have got that right, no meeting of the Society can take it away.

The SECRETARY.—That is an interesting question of interpretation of

the Constitution ; it has been interpreted in one way by the Board of Direction, and by a great many members in another way. This meeting, however, has just passed a recommendation to the Society to adopt the newly proposed Article XXXIII., which will make it impossible for you to have that right, and I think you voted for it.

Mr. MICHAELIS.—That is a good answer ; I shall vote for the resolution now.

Mr. J. P. DAVIS.—I think Mr. Michaelis did not understand Mr. Bogart's statement. I should like to ask, however, whilst I am up, supposing somebody was requested to write a law in the Constitution which did require us to put forth the original amendment and the amendments proposed here, how would they write it any differently from the law we have in our Constitution ? It says that the original amendment as proposed shall be sent out, and with such amendments thereto as may have been approved by a majority vote of the annual meeting. I would like to know how any one would write it any differently ?

The CHAIR.—The question, of course, is one that involves some difficulties, as you can at once see. And although it was settled in this way by the Board of Direction, still, as a member of the Board, I believe I was on the other side of that question. That accounts for my position before you. I must say that I relied somewhat on the fact that the change is so very slight that the Society had a right to decide what should be sent out. That is the view that I had taken of it. And I have not thought of the subject very fully until this point came up. In looking over the amendment as adopted, I see that if the parties offering the first amendment found this unacceptable to them, they would have reason to find fault ; but I had no idea that such could be the case.

Mr. MACDONALD.—I think if Mr. Boller's resolution is worded so as to request the Board of Direction to issue only the amended amendment it will cover the whole point.

Mr. BOLLER.—I will accept that.

The CHAIR.—Mr. Boller's motion, in the form he puts it now, requests the Board of Direction to send this amended amendment out.

Mr. J. P. DAVIS.—I think it is simply embarrassing the Board of Direction. I think it is hardly fair to embarrass the Board of Direction. We have the Constitution, and by that we have got to go. And the Board of Direction have got to interpret it. It would be very embarrassing to go against any request of this Society. It is simply embarrassing the Board of Direction.

Mr. MICHAELIS.—I think I have a solution to the problem. I would suggest that the Constitution be complied with ; and, upon mature reflection, I think the Director who has last spoken is right. But I think it is perfectly proper, when these various amendments are issued, that the points mentioned by Mr. Shinn be distinctly stated, and that the danger of this division be pointed out, and it be left to the

good sense of members to put their vote where it will do the most good.

Mr. BOLLER.—I withdraw my motion.

Mr. J. P. DAVIS.—Prof. Wood offered a resolution, which was seconded, when this resolution arose, and his resolution was not considered. I call on Prof. Wood to read his resolution again.

Mr. EGLESTON.—I would like to make another point—that the whole discussion is irregular, because Mr. Shinn's paper was in order, and, therefore, whenever this discussion ceases, discussion on Mr. Shinn's paper is in order.

The CHAIR.—That is proper. We will return to the discussion of Mr. Shinn's paper.

The discussion of the paper by Mr. William P. Shinn on the "Increased Efficiency of Railways for the Transportation of Freight," was then resumed.

Discussion was presented by letter, through the Secretary, from Messrs. Charles Paine, E. P. Vining and Joseph S. Paxson.

The discussion was continued verbally by Messrs. Sanderson and Robert L. Harris.

At 5:30 P. M. a recess was taken to 8 P. M.

The session of the Annual Meeting was resumed at 8 P. M., Vice-President Paine in the chair; John Bogart, Secretary.

The discussion of the paper by Mr. William P. Shinn on "The Increased Efficiency of Railways for the Transportation of Freight," was continued by Messrs. R. L. Harris, Coryell, Emery, Chanute, Charles H. Fisher, Bissell, Forney, Cooper and Shinn.

The Secretary announced the receipt, since the last meeting of the Society, of notification of the death of Messrs.—

Edgar S. Cary. Elected Member November 1st, 1882. Died January 5th, 1883.

Theodore G. Ellis. Past Vice-President and Fellow of the Society. Elected Member February 17th, 1869; Fellow, November 21st, 1872. Died January 9th, 1883.

William R. Morley. Elected Member September 6th, 1882. Died January 3d, 1883.

The Annual Meeting then adjourned.

The Members of the Society present at the Annual Meeting were: A. V. Abbott, Wm. M. Allaire, E. R. Andrews, W. H. Atwood, John Avery, John W. Bacon, George S. Baxter, Van Brunt Bergen, Charles E. Billin, George H. Bishop, H. Bissell, W. H. Bixby, H. D. Blunden, John Bogart, A. P. Boller, H. R. Bradbury, Thomas E. Brown, Jr., L. L. Buck, Wm. H. Burr, Frank A. Calkins, O. Chanute, Jacob M. Clark, Thomas M. Cleemann, F. Collingwood, C. Constable, Theodore Cooper, Martin Coryell, J. James R. Croes, Horace Crosby, Wilson Crosby, J.

Foster Crowell, W. R. Curtis, Charles G. Darrach, Joseph P. Davis, P. P. Dickinson, C. Wheeler Durham, Thomas Egleston, Theo. N. Ely, Charles E. Emery, John W. Ferguson, Albert Fink, Charles H. Fisher, Clark Fisher, M. N. Forney, George H. Frost, C. C. Gilman, E. E. Glaskin, Charles E. Goad, John M. Goodwin, Samuel M. Gray, David M. Greene, George S. Greene, George S. Greene, Jr., Stephen S. Haight, William G. Hamilton, Robert L. Harris, Charles H. Haswell, Rudolph Hering, William P. Judson, J. M. Knap, E. D. Leavitt, Jr., G. Leverich, John Lockwood, Thomas J. Long, Charles Macdonald, Wm. W. Maclay, Arthur Macy, Edward Marsland, C. C. Martin, C. S. Maurice, D. E. McComb, T. H. McKenzie, George W. McNulty, F. W. Merz, O. E. Michaelis, W. A. Nichols, Edward P. North, F. O. Norton, Ellis B. Noyes, S. B. Opdyke, Jr., Joseph O. Osgood, James Owen, A. B. Paine, Charles Paine, William H. Paine, Francis I. Palmer, John A. Partridge, Edward S. Philbrick, James C. Post, Benjamin Rhodes, Edward S. Safford, J. Gardner Sanderson, William H. Searles, William P. Shinn, S. H. Shreve, T. E. Sickels, R. P. Staats, D. McN. Stauffer, Cook Talcott, R. H. Thurston, M. M. Tidd, Stevenson Towle, Robert Van Buren, John G. Van Horne, E. B. Van Winkle, W. W. Walker, C. D. Ward, L. B. Ward, Nelson J. Welton, Frank W. Whitlock, Thomas J. Whitman, Wm. H. Wiley, W. W. Wilson, De Volson Wood and William E. Worthen.

The members of the Society on Thursday morning met as arranged in the programme given below, which was carried out in all its details. The reception at the house of the Society on Thursday evening was largely attended and was a very agreeable social event.

## AMERICAN SOCIETY OF CIVIL ENGINEERS.

ANNUAL MEETING, JANUARY 17TH AND 18TH, 1883.

### PROGRAMME.

WEDNESDAY, JANUARY 17TH.—The Annual Meeting will be held at the House of the Society, beginning at 10 A. M.

The day will be devoted to business and professional discussions, as follows :

Canvass of ballots and announcement of Election of Officers of the Society. Presentation of the Annual Reports of the Board of Direction, of the Treasurer and of the Finance Committee. Report of the Committee on a Uniform System for Tests of Cements ; of the Committee on the Preservation of Timber ; of the Committee on Uniform Standard Time. Discussion of the subjects presented by the Reports of the Board of Direction and of Committees. Award of the Norman Medal for the past year. Determination of Place and Time for next Convention. Discus-

sion of proposed Amendments to the Constitution which have been previously submitted. General Business. Discussion of technical subjects. The paper recently read before the Society by Mr. William P. Shinn, M. Am. Soc. C. E., on the *Increased Efficiency of Railways for the Transportation of Freight*, will, by resolution of the Society, be in order for discussion.

It is expected that business may occupy the morning session, and that discussion on Mr. Shinn's paper, and other technical questions, will begin at the afternoon session.

Lunch will be served at the Society house at 1 P.M. After lunch, the session will be resumed at 2.30 P.M., and if found desirable, an evening session will also be held.

THURSDAY, JANUARY 18TH.—9 A.M.—Meet at Society House, 127 East 23d Street. 9.30 A.M.—Elevated Railroad to Battery. 10 A.M.—Proceed foot of Whitehall Street to Erie Basin, by Navy Yard tug, kindly tendered for use of the Society by Commodore J. H. Upshur, commanding Navy Yard, New York. 10.30 A.M.—Inspection of the Dry Docks at Erie Basin. There are two of these docks. They are understood to be the largest in the country. The steamer *City of Berlin*, 526 feet in length, 5 491 tons, is now in one of these docks. The docks will be inspected under the guidance of Messrs. J. E. Simpson & Co., the builders, and of Messrs. M. M. Tidd and F. C. Prindle, Members Am. Soc. C. E. 11.30 A.M.—Proceed by tug to Brooklyn wharf of the New York and Brooklyn Bridge. 12 NOON.—Examination of New York and Brooklyn Bridge. Provision has been made for the party to pass over the footway, which is nearly completed. The inspection of the works of the bridge will be in charge of the Engineers connected with their construction. 1.30 P.M.—Lunch at Delmonico's, Beaver Street, by invitation of Wm. G. Hamilton, Esq., Director Am. Soc. C. E. 2.30 P.M.—Visit to the Mills Building, Wall and Broad Streets. This visit is by invitation of D. O. Mills, Esq., the owner, and George B. Post, Esq., the architect of the building, who will kindly conduct the party on this occasion. 3.30 P.M.—Inspection of the works of the New York Steam Company, 174 Greenwich Street, near Cortland Street. This inspection will be made under the guidance of Messrs. William P. Shinn and Charles E. Emery, Members Am. Soc. C. E. 8 P.M.—Reception.

# American Society of Civil Engineers.

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## PROCEEDINGS.

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Vol. IX.—February, 1883.

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### REPORT OF THE BOARD OF DIRECTION

*For the Year ending December 31st, 1882.*

Presented and accepted at the Annual Meeting, January 17th, 1883.

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The Board of Direction, in compliance with the provisions of the Society law, presents the following report for the year ending December 31st, 1882 :

As shown by the tabular statement given hereinafter, there have been during the year 80 additions to the various classes of Society membership, and 19 additional subscriptions to the Building Fund, 4 of the latter being from persons not otherwise connected with the Society.

The various classes of membership have lost during the year 12 by death, 3 by resignation, and 3 by transfers to other classes, making the net increase for the year 66.

The Society membership at this date, December 31st, 1882, is as follows :

Honorary members, resident....	2	Non-resident....	8	Total...	10
Corresponding members.....		"	3	"	3
Members, resident .....	129	"	436	"	565
Associates, " .....	11	"	19	"	30
Juniors, " .....	10	"	48	"	58
					—653
Making, resident.....	152	Non-resident ....	514		—
Total.....					666

Fellows, 63, of whom 9 members and 1 honorary member are included above, leaving..... 53

Total members and Fellows of the Society.....719

Subscribers to the Building Fund, 128, of whom 87 are entered in one or other of the above classifications, and 4 deceased, leaving..... 37

Total connected with the Society January 1st, 1883.....756

Tables showing the membership at the beginning of the year, and the changes in the various classes, are given in a subsequent part of this report.

The increase in the membership of the Society is steady and healthful; the standard of qualification continues to be applied as heretofore; the interest in the Society by its members is constantly increasing. This is manifest in many ways, as, for instance, in the constantly increasing number of letters received from members. The labor devolving upon the management increases much more largely than is indicated merely by the increase in number of the membership. The addressed communications, circulars, papers, pamphlets, ballots, and letters on various subjects issued by the Secretary during the past year number over 44 500.

The annual Convention of the Society for the past year was held at Washington, D. C., May 16th—19th, 1882, and was attended by over 100 members.

The proceedings of the Convention have been fully published in the Society proceedings. The interest of members in the Conventions continues sustained, and the increasing importance of these annual opportunities for the meeting of so many engineers is very evident. The determination of the time and place for the next Convention will be made by the Society at this meeting. Numerous suggestions upon this point have been received from members in answer to the circular recently issued by the Secretary, which suggestions will be directly laid before you.

The Building Fund of the Society has been increased during the year by 19 subscriptions, amounting to \$2 645.

The mortgage upon the house of the Society has been reduced to \$16 000.

The relief which is felt in the management of Society affairs by the ownership of the Society house, and by the reduction of the annual charge for rental or mortgage interest, is very great. The Board earnestly repeats the appeal heretofore made for the increase of the Building Fund by subscriptions from members or from other persons feeling an interest in the permanent welfare of the Society.

It is quite certain that the presentation of the subject would induce subscriptions from persons interested in public improvements or in the progress of engineering, many of whom would be glad to regularly receive the Transactions of the Society. These Transactions are sent for the life of the subscriber for each subscription of \$100. When the fund was inaugurated 19 subscriptions from non-members were secured by the exertions of one member of the Society. The whole number of subscriptions from non-members is now 37, and the amount of these subscriptions is \$4 865.

Connected with the Society in the various classes of membership there are now 719 persons, 87 of whom have become subscribers to the Building Fund, and 632 have not.

The Transactions and Proceedings of the Society have, it is believed, been maintained with the high standard heretofore characterizing the papers published.

The Board of Direction desires particularly to impress upon the members that the continuance of the value of this part of the Society work must depend almost entirely upon the interest felt by members in the subject, which interest can be best shown by the contribution to the Transactions of papers giving the record of engineering work and experience, and of discussions upon professional topics.

It is earnestly hoped that the members of this Society will recollect that it is only by their assistance that these Transactions can be maintained. As the membership increases an increased amount of printing can be afforded, but the material for this must come from engineers who are in charge of, or connected with, the public works which it is desirable to describe.

At the last annual meeting, and at the Convention, reports were presented from the Committee on Standard Time, showing that great interest is felt in this country upon the subject, and that replies to the circular of the committee had been received from numerous sources. The committee will, at this meeting, present a report of progress, with additional recommendations.

The subject of compounding annual dues by the payment of a single sum, and the creation thereby of life membership in the Society, was



discussed at the last annual meeting. The amendment to the Constitution, then considered, was not carried by the vote of the Society, but the subject was afterwards referred to the Board of Direction, with a request that a plan should be presented by that Board for this purpose. This has been done, and the proposed plan is embodied in an amendment to the Constitution, which has been issued to the Society, and which will be in order for discussion at this meeting.

The Fellowship Fund of the Society has had no increase during the year. This fund was originally instituted to secure a capital, the income of which should be devoted to the publication of the papers of the Society. There have been very few accessions to the fund for a number of years. It is believed, however, that if the conditions were more generally understood under which fellowship of the Society may be obtained by suitable persons, there would soon result a decided addition to the number. Fellows need not be engineers. The provisions of the Society law admit to this class any persons, whether members or not, who are suitably recommended, and who feel sufficient interest in the objects of the Society and in its publications to become Fellows, contributing for that purpose the small amount of the fellowship subscription and thereby becoming connected with the Society for life. Members are reminded that it is probable that the presentation of this subject to suitable persons of their acquaintance might result in a considerable addition to this class, and that there is very little doubt that many persons, not eligible as members, would be glad to thus secure the publications of the Society.

At the last annual meeting the Board of Direction presented a report upon the subject of Tests of Structural Materials, embracing with it the report of a committee appointed on that subject at the previous Convention of June, 1881. At the annual meeting, the Board of Direction was authorized to memorialize Congress, and to promote, as far as it could be done without incurring expense, the introduction and framing of a law adequate to resume the investigation into the strength of structures and the parts and materials of which they are composed.

In accordance with this resolution, a bill was prepared and presented to Congress on the subject, and a memorial, properly signed, was also presented. This was done by the Board of Direction after discussion with members of this Society and of other kindred organizations. The subject was discussed at the Convention at Washington, when the bill which had been presented to Congress was reported to the Society.

Members of the Board of Direction, aided by other members of the Society, visited Washington at various times, and used their endeavors to effect a successful result. The bill, however, did not pass Congress.

There was introduced in the Army Appropriation Bill, passed June 30th, 1882, the following clause :

"For caring for, preserving, using and operating the United States testing machine at the Watertown Arsenal, ten thousand dollars :

"*Provided*, That the tests of iron and steel, and other materials for industrial purposes, shall be continued during the next fiscal year, and report thereof shall be made to Congress. *And provided further*, That in making tests for private citizens, the officer in charge may require payment in advance, and may use the funds so received in making such private tests, making full report thereof to the Chief of Ordnance ; and the Chief of Ordnance shall give attention to such programme of tests as may be submitted by the American Society of Civil Engineers, and the record of such tests shall be furnished said Society, to be by them published at their own expense."

The subject having been referred to the Board of Direction, letters were sent to many persons interested in the investigation, the production and use of structural materials, and a number of replies were received. These replies were carefully collated and referred to a committee of the Board. The late President of the Society, Mr. Ashbel Welch, was the chairman of the committee in charge of this subject, and he took a deep interest in its successful accomplishment.

After his decease the Board of Direction requested and received the advice and co-operation of a number of gentlemen, members of this Society, of the American Institute of Mining Engineers and of the American Society of Mechanical Engineers. Basing their action upon the communications received from the various sources referred to above, a programme was prepared by the Board of Direction, in consultation with these gentlemen, with a view of securing the largest immediate results with the small amount appropriated. This programme was presented by Vice-President William H. Paine to the Chief of Ordnance, and it is proposed by that officer to issue circulars upon the subject, copies of which will be printed in the Proceedings of the Society as soon as furnished.

The publication of the records of the tests to be made has been entrusted by law to this Society. It is the purpose of the Board of Direction to arrange the publication of these records, as they may be received from time to time, in such a way as to insure a full circulation of them among all who may be interested.

The Standing Committee on the Preservation of Timber presented an interesting report of progress at the Washington Convention. This report has been printed in the Transactions of the Society, and it is expected that the committee will at this meeting report further progress.

The Norman Medal for 1881 was awarded to Paper No. CCXXIII., upon the Reinforcement of the Anchorage and Renewal of the Suspended Structure of the Niagara Railroad Suspension Bridge. The author is Mr. L. L. Buck, M. Am. Soc. C. E.

The Board of Censors to award the Norinan Medal for the past year will make a report at this meeting.

In June, 1882, an ordinance was received by the Board of Direction, which had been passed by the Councils and approved by the Mayor of the City of Philadelphia, requesting this Society, conjointly with the Franklin Institute of Philadelphia, to nominate to the Mayor of that city the names of nine engineers. From these the Mayor was requested to select three, to act in conjunction with the Chief Engineer of the Water Department of Philadelphia as a Board of Experts in reference to the water supply of that city.

The Board of Direction thereupon consulted the Society upon the subject, requesting an expression of opinion upon the following question :

“Do you consider it expedient and advisable that the Board of Direction of the American Society of Civil Engineers should comply with requests to nominate engineers from whom may be selected members of advisory professional boards ?”

The vote upon this question showing a large majority in the affirmative, the Board of Direction, after considerable correspondence, did nominate, conjointly with the Franklin Institute, the names of nine engineers. This action was not, however, perfected until October 18th, 1882.

It having been found that there was great confusion in the method of designating members of the Society as such, the Board of Direction has issued the following recommendation :

## AMERICAN SOCIETY OF CIVIL ENGINEERS.

### ABBREVIATIONS FOR DESIGNATING MEMBERSHIP.

The Board of Direction has declared the following as the authorized abbreviations to be used by Members of the Society having occasion to designate themselves as such :

For Honorary Members.....	Hon. M. Am. Soc. C. E.
For Members.....	M. Am. Soc. C. E.
For Associates.....	Assoc. Am. Soc. C. E.
For Juniors.....	Jun. Am. Soc. C. E.
For Fellows.....	F. Am. Soc. C. E.

The Board requests the use of the above forms in all cases.

JOHN BOGART,

*Secretary Am. Soc. C. E.*

The following tables show the changes and additions during the year in the various classes of Society membership :

On January 1st, 1882, the date of the last report, the membership in the Society was :

Honorary members, resident....	3	Non-resident....	8	Total...	11
Corresponding members.....		"	3	"	3
Members, resident.....	119	"	394	"	513
Associates, ".....	9	"	15	"	24
Juniors, ".....	8	"	46	"	54
					—591
Making, resident.....	139	Non-resident....	466		
Total.....					605

Fellows, 63, of whom 10 members and 1 honorary member are included above, leaving..... 52

Total members and Fellows..... 657

Subscribers to the Building Fund, 110, of whom 77 are entered in one or other of the above classifications, leaving..... 33

Total connected with the Society January 1st, 1882..... 690

At the present date, January 1st, 1883, the membership is :

Honorary members, resident....	2	Non-resident....	8	Total...	10
Corresponding members.....		"	3	"	3
Members, resident.....	129	"	436	"	565
Associates, ".....	11	"	19	"	30
Juniors, ".....	10	"	48	"	58
					—653
Making, resident.....	152	Non-resident....	514		
Total.....					666

Fellows, 63, of whom 9 members and 1 honorary member are included above, leaving..... 53

Total members and Fellows..... 719

Subscribers to the Building Fund, 128, of whom 87 are entered in one or other of the above classifications and 4 deceased, leaving. 37

Total connected with the Society January 1st, 1883..... 756

The additions during the past year to the several classes of Society membership have been :

Members qualified.....	63
Former members restored.....	1
Associates qualified.....	6
Juniors qualified.....	10
<b>Total additions to the several classes of membership.....</b>	<b>80</b>
Subscribers to Building Fund not otherwise connected with the Society.....	4
<b>Total additions.....</b>	<b>84</b>

The decrease during the year in the several classes of membership has been :

Honorary members.Died 1.....	1
Members..... " 10..Resigned 4*.....	14
Juniors..... " 1.. " 0 Transferred to member 3	4
<b>Totals.....Deaths 12, Resignations 4, Transfers.....</b>	<b>19</b>
*1 Resigned membership but continues a Fellow.....	1
	<b>18</b>

There has thus been an addition of 84 to the various classes of membership and subscribers to the Building Fund, and a loss by deaths, resignations and transfers of 18, making the actual net additions during the year 66 in number.

On January 1st, 1882, there were, as stated in the last Annual Report, 15 proposals pending; 79 proposals have been received during the year; 74 candidates have been elected Members, of whom 3 were transferred from Juniors; 6 candidates have been elected Associates; 10 candidates have been elected Juniors; 1 candidate has been elected a Fellow.

63 persons have, during the year, qualified as Members; 6 have qualified as Associates; 10 have qualified as Juniors; 7 candidates elected during the year as Members and 1 as Fellow have not yet qualified; there are 5 proposals now pending.

Twenty-one meetings of the Society were held during the year, one of which was the Annual Meeting, held in New York January 18th and 19th, and the other the Annual Convention, held in Washington, D. C., May 16th to 19th; all the sessions of the Convention, including the business meeting, being counted as one meeting of the Society. Meetings have been held on the first and third Wednesdays of each month, except that there were no meetings in August, and but one in July.

Eighteen meetings of the Board of Direction have been held during the year.

A joint meeting of this Society, the American Institute of Mining

Engineers and the American Society of Mechanical Engineers was held in the Theatre of the Turf Club, November 1st, 1882, in memory of Alexander Lyman Holley, past Vice-President of the Society, on which occasion Dr. R. W. Raymond delivered an address.

The Library has been increased during the year by the following additions :

Number of books bound.....	112
“ “ “ unbound.....	98
“ “ pamphlets.....	276
“ “ maps and plans.....	18
“ “ photographs.....	20
“ “ drawings, specifications, models and specimens.....	52

These do not include magazines and papers contributed to the Society by publishers, or received in exchange for the Transactions, a list of which is given in an appendix to this report.

The present state of the Library is about as follows:

Books and pamphlets.....	10,093
Manuscripts.....	120
Maps, plans, drawings, charts, photographs and engravings.....	2,200
Models and specimens.....	348

Reports made during the year have been as follows:

By the Board of Direction: The Annual Report, a Report on the subject of Tests of Structural Materials, a Report on the subject of Compounding Dues and the creation of Life Membership.

By the Finance Committee: Annual Report on the Finances of the Society; Quarterly Reports to the Board of Direction.

By the Library Committee: Regular Monthly Reports on the Library and on Publications; Report on Abbreviations for designating Membership.

By the Secretary: Monthly Reports to the Board of Direction; Occasional Reports on Current Business.

By the Treasurer: The Annual Report of the Treasurer; Monthly Reports to the Board of Direction.

By the Committee on Gauging of Streams: 1 Report, and the Committee discharged.

By the Committee on Uniform System for Tests of Cement: 2 Reports.

By the Committee on Preservation of Timber: 2 Reports.

By the Committee on a Uniform System of Standard Time: 2 Reports.

By the Nominating Committee: 1 Report.

The Treasurer's Annual Report, the Report of the Finance Committee, and Reports from the Committees on a Uniform System of Tests of

Cement; on the Preservation of Timber; on Uniform Standard Time, and on the Award of the Norman Medal, will be submitted at this meeting.

The proposed Amendments to the Constitution, which have been presented since the last Annual Meeting, have been printed and distributed to members, and will now be submitted for discussion.

The Society has lost by death, during the term covered by this report, its President, Ashbel Welch; one Honorary Member, Gen. John G. Barnard, U. S. A.; nine members, Messrs. Alexander L. Holley, Past Vice-President, Moses Lane, Theodore R. Scowden, Gen. William W. Wright, Caleb G. Forshey, Maj. Charles W. Howell, U. S. A., William B. Hyde, Robert Briggs and Henrique Harris ; and one Junior, Mr. Ira E. Clark. Appropriate memoirs of these deceased members have been, or will be, published in the Proceedings. The Board, however, desires to express in this Report its sense of the great loss the Society, the profession and the public have sustained in the death of Mr. Ashbel Welch, late President of the American Society of Civil Engineers.

Respectfully submitted,

JOHN BOGART,

*Secretary.*

# REPORT OF THE TREASURER

FOR THE YEAR ENDING DECEMBER 31ST, 1882.

*Presented at the Annual Meeting, January 17th, 1883.*

## RECEIPTS.

Balance on hand December 31st, 1882, General Fund.....	\$2,459 45
"                    "                    Building Fund.....	3,055 62
Entrance fees.....	2,240 00
Current Dues—For year ending December 31st, 1882:	
From 70 Resident Members.....	\$1,737 50
"    287 Non-resident Members..	4,041 06
"        5 Resident Associates.....	75 00
"    12 Non-resident Associates..	115 00
"        6 Resident Juniors.....	82 50
"    39 Non-resident Juniors....	380 00
	<hr/>
	6,431 06
Past Dues—From 42 Resident Members.....	\$520 56
"    141 Non-resident Members.....	859 50
"        4 Resident Associates.....	63 00
"        6 Non-resident Associates....	29 96
"    17 Non-resident Juniors.....	28 23
	<hr/>
	1,501 25
Dues for year beginning January 1st, 1883:	
From 34 Resident Members.....	\$850 00
"    112 Non-resident Members.....	1,647 75
"        3 Resident Associates.....	45 00
"        4 Non-resident Associates.....	40 00
"    11 Non-resident Juniors.....	110 00
	<hr/>
	2,692 75
Sales of Publications.....	400 33
Certificates of Membership.....	131 00
Advertisements.....	225 00
Interest on Fellowship Fund Bonds.....	\$157 50
"    Savings Bank Deposit.....	50 94
"    Norman Medal Fund Bond.....	70 00
"    Railroad Stock.....	82 80
	<hr/>
	361 24
Subscriptions to Building Fund.....	2,645 00
	<hr/>
	<u>\$22,142 70</u>



## DISBURSEMENTS.

Interest on Mortgage.....	\$905 00
Taxes.....	495 00
Publications.....	2,880 70
Stationery and Printing.....	677 48
Postage.....	712 11
Library.....	917 85
Salaries.....	3,000 00
Convention and Annual Meeting.....	409 52
Janitor, House Supplies, Fuel, Water and Gas.....	1,192 16
Certificates of Membership.....	66 85
Insurance.....	62 50
Norman Medal.....	70 75
Payments from Building Fund.....	4,188 85
Other expenditures.....	302 11
Transferred to Savings Bank Deposit.....	30 90
On hand, Building Fund.....	1,511 77
On hand, General Fund.....	4,719 15
	<hr/>
	\$22,142 70

The Funds of the Society are as follows:

## Fellowship Fund:

80 Subscriptions.....	\$8,150 00
Premiums and Accumulated Interest, Decem- ber 31st, 1881.....	1,852 75
	<hr/>
Fund on hand, December 31st, 1881.....	\$10,002 75
Interest received during 1882.....	208 44
	<hr/>
	\$10,211 19

## Expended from fund:

For Publications during 1882.....	157 50
	<hr/>
	\$10,053 69

## The present investment of the Fellowship Fund

is, at par value:

9 United States Government Bonds.....	\$9,000 00
Deposit in Seamen's Bank for Savings.....	1,053 69
	<hr/>
	\$10,053 69

## Norman Medal Fund:

1 Certificate Croton Aqueduct Stock, New York City....	\$1,000 00
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**General Investment:**

10 Shares New York Central and Hudson River R. R. Stock.....	\$1,000 00	
1 Consolidated Certificate New York Central and Hudson River R. R. Stock.....	35 00	
		<hr/> \$1,035 00

**Building Fund:**

Receipts previous to Jan. 1st, 1882.....	\$14,012 00
“ during 1882.....	2,645 00
	<hr/>
Total receipts up to Jan. 1st, 1883.....	\$16,657 00

**Expended:**

For Legal Services, Circulars, etc..	\$355 03
For Betterments on Property.....	790 20
Payments on Purchase.....	14,000 00
	<hr/> 15,145 23

On hand Dec. 31st, 1882..... \$1,511 77

Respectfully submitted,

J. JAMES R. CROES,  
*Treasurer.*

**REPORT OF THE COMMITTEE ON FINANCE.**

PRESENTED, READ AND ACCEPTED AT THE ANNUAL MEETING, JANUARY  
17TH, 1883.

The Committee on Finance respectfully report that they have audited all of the bills as they have been presented during the past year.

At the close of the year they examined the accounts of the Treasurer, personally inspecting all of the assets and liabilities of the Society, and certify that the report of the Treasurer is correct.

W. H. PAINE,  
JOS. P. DAVIS,  
GEO. S. GREENE, Jr.,  
*Committee on Finance.*

# LIST OF PUBLICATIONS AND PAPERS RECEIVED FOR LIBRARY.

APPENDIX TO ANNUAL REPORT OF THE BOARD OF DIRECTION,  
JANUARY 17TH, 1883.

The following papers are contributed to the Society, or are received  
in exchange for Transactions :

American Architect and Building News.....	Weekly.....	Boston.
American Engineer.....	" .....	Chicago.
American Gas Light Journal.....	Semi-Monthly..	New York.
American Machinist.....	Weekly .....	" .....
Annales des Travaux Publics.....	Monthly.....	Paris.
Army and Navy Journal.....	Weekly.....	New York.
Builder.....	" .....	London.
Building and Engineering News.....	" .....	" .....
Bulletin American Iron and Steel Association.....	Semi-Monthly..	Philadelphia.
Bulletin du Canal Interocéanique.....	" .....	Paris.
Commissioner of Patents' Journal.....	Semi-Weekly..	London.
Deutsche Bauzeitung.....	Weekly.....	Berlin.
Engineer.....	" .....	London.
Engineering (2 copies) .....	" .....	" .....
Engineering and Mining Journal.....	" .....	New York.
Engineering News.....	" .....	" .....
Genie Civil.....	" .....	Paris.
Iron.....	" .....	London.
Iron Age.....	" .....	New York.
Journal of the Association of Engineering Societies .....	Monthly.....	" .....
" of Artillery and Military Engineering .....	" .....	Vienna.
" of Society of Arts.....	Weekly .....	London.
" of Gas Lighting.....	" .....	" .....
Manufacturer and Builder.....	Monthly.....	New York.
Manufacturer and Iron World .....	Weekly .....	Pittsburgh.
Mechanical News .....	Semi-Monthly..	New York.
Mechanics.....	Weekly .....	" .....
National Car Builder.....	Monthly.....	" .....
Record of Scientific Literature.....	" .....	" .....
Railroad Gazette.....	Weekly.....	" .....
Railway Age.....	" .....	Chicago.
Railway Review.....	" .....	" .....
Railway World.....	" .....	Philadelphia.
Reportorium der Technischen Literatur.....	" .....	Leipsig.
Revue Générale des Chemins de fer .....	Monthly.....	Paris.
Sanitary Engineer.....	Weekly.....	New York.
Scientific American.....	" .....	" .....
Scientific American Supplement .....	" .....	" .....
Tehnic Tidskrift.....	Monthly.....	Stockholm.
Techniker.....	Semi-Monthly..	New York.
Telegraph Journal and Electric Review .....	" .....	London.
The Locomotive.....	Monthly.....	Hartford.
Van Nostrand's Magazine.....	" .....	New York.
Zeitschrift für Baukunde.....	Quarterly .....	Munich.
Zeitschrift für Bauwesens.....	" .....	Berlin.

The following are subscribed for :

American Bookseller.....	Semi-Monthly..	New York
American Catalogue.....	" " "	"
American Library Journal.....	Monthly.....	"
Index.....	"	"
Bookseller.....	"	London.
Publishers' Weekly .....	Weekly.....	New York.
U. S. Official Postal Guide .....	Monthly.....	Boston.

The Society has received during the year, in exchange for the "Transactions," official publications of the following associations, in many instances for preceding years :

Aeronautical Society of Great Britain.....	London.
Academy of Sciences.....	Washington.
Akademie des Bauwesens.....	Berlin.
American Chemical Society.....	New York.
American Gas Light Association.....	"
American Institute of Architects.....	"
American Institute of Mining Engineers.....	Easton.
American Iron and Steel Association .....	Philadelphia.
American Society of Mechanical Engineers.....	New York.
Annales de Construcciones Civiles y de Minas.....	Lima.
Annales des Ponts et Chaussées.....	Paris.
Argentine Scientific Society.....	Buenos Ayres.
Association of Civil Engineers.....	Lisbon.
Austrian Society of Engineers and Architects (Two Publications).....	Vienna.
Boston Public Library.....	Boston.
Boston Society of Civil Engineers.....	"
Civil Engineers' Club of Cleveland.....	Cleveland.
Die Administration der " Mittheilungen ".....	Vienna.
Engineers' Club of Philadelphia.....	Philadelphia.
Engineers' Club of St. Louis.....	St. Louis.
Engineer Department, U. S. A .....	Washington.
Engineers' Society, Western Pennsylvania.....	Pittsburgh.
Essayons' Club, Corps of Engineers, U. S. A.....	Willetts Point.
Franklin Institute Journal .....	Philadelphia.
Imperial School .....	Moscow.
Imperial Technic Society of Russia.....	St. Petersburg.
Imperial University.....	Tokio.
Institution of Civil Engineers.....	London.
" " of Ireland.....	Dublin.
" of Engineers and Shipbuilders of Scotland.....	Glasgow.
" of Mechanical Engineers.....	London.
Iron and Steel Institute .....	"
Massachusetts Institute of Technology.....	Boston.
McGill University, Department of Science.....	Montreal.
Mechanics' Institute.....	San Francisco.
Midland Institute Mining, Civil and Mechanical Engineers .....	Barnsley, Eng.
Mining Institute of Scotland.....	Hamilton.
New York Meteorological Observatory .....	New York.
North of England Institute of Mining and Mechanical Engineers.....	Newcastle-on-Tyne.
Pi Eta Scientific Society .....	Troy.
Royal United Service Institution.....	London.
School of Mines, Columbia College.....	New York.
Smithsonian Institution.....	Washington.

Society of Arts.....	London.
Society of Civil Engineers.....	Paris.
Society of Engineers.....	London.
Society of Engineers and Architects.....	Cologne.
Society of Engineers and Architects of Hungary.....	Budapest.
“ “ “ of Saxony.....	Dresden.
“ “ “ .....	Hanover.
Stevens Institute of Technology.....	Hoboken.
Swedish Society of Engineers.....	Stockholm.
Thayer Scientific School, Dartmouth College .....	Hanover.
Thomason Civil Engineering College, Indian Engineering.....	Roorkee.
United States Coast Survey.....	Washington
“ Light House Board.....	“
“ Naval Institute.....	Annapolis.
“ Naval Observatory.....	Washington
“ Ordnance Department.....	“
“ Patent Office.....	“
University of Michigan.....	Ann Arbor.
Western Society of Engineers.....	Chicago.

# American Society of Civil Engineers.

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## PROCEEDINGS.

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Vol. IX.—March, 1883.

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## MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

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### OF THE SOCIETY.

**JANUARY 3d, 1883.**—The Society met at 8 p. m., Vice-President Paine in the chair; John Bogart, Secretary. Ballots for membership were canvassed, and the following candidates declared elected:

As members, Hiel Hamilton Filley, Mexico, Mexico; Arthur J. Frith, Hotchkiss, Tenn.; Joseph Palmer Frizell, St. Paul, Minn.; George Herndon Pegram (elected Junior, April 7th, 1880), Wilmington, Del. As Junior, Charles Frederick Loweth, Council Bluffs, Iowa.

A paper on Railroad Economics as a Pseudo-Science, was read by Mr. William P. Shinn, and discussed by Messrs. Chanute, Cooper, Forney, Chas. H. Fisher, Emery and Shinn.

**FEBRUARY 7TH, 1883.**—The Society met at 8 p. m., Director Joseph P. Davis in the Chair; John Bogart, Secretary. The death of Charles E. Fowler, M. Am. Soc. C. E., on January 28th, 1883, was announced. The subject of "Tests of Structural Materials" was discussed by Messrs. Cooper, Bogart, Emery and Morison.

**FEBRUARY 21ST, 1883.**—The Society met at 8 p. m., Vice-President Paine in the Chair; John Bogart, Secretary. A discussion on "Weights

and Measures," by Jacob M. Clark, M. Am. Soc. C. E., was read, and the subject discussed by Messrs. Bixby, Bogart, Jacob M. Clark, T. C. Clarke, Compton, Croes, J. P. Davis, Emery, North and Striedinger.

### OF THE BOARD OF DIRECTION.

JANUARY 2D, 1883.—Applications were considered; appropriations made, and arrangements for the Annual Meeting considered.

JANUARY 15TH, 1883.—Applications were considered; appropriations were made. The Annual Report was presented by the Secretary, considered and adopted.

JANUARY 20TH, 1883.—The Board of Direction, elected at the Annual Meeting, January 17th, 1883, met, organized, and under the provisions of the Constitution the following Standing Committees were appointed:

*On Finance:* WILLIAM H. PAINE,  
GEORGE S. GREENE, JR.,  
WILLIAM G. HAMILTON.

*On Library:* J. JAMES R. CROES,  
JOSEPH P. DAVIS,  
WILLIAM E. MERRILL.

Under the resolution passed by the Society at the Annual Meeting, a Special Committee was appointed in reference to appropriations for the continuance of "Tests of Structural Materials." Applications were considered. It was decided that the proposed amendments to the Constitution be issued for letter-ballot both as originally proposed and as amended by the Annual Meeting. The Board, having originally reported to the Society the proposed amendment in reference to the Commutation of Dues by one payment, now determined to recommend that all members desiring to vote in favor of the Commutation of Dues, should vote for the proposed amendment to Article XXII. of the Constitution in the form as amended by the Annual Meeting.

FEBRUARY 14TH, 1883.—Applications were considered. Action was taken as to Arrears of Dues; as to the preparation of the Norman Medal awarded at the Annual Meeting; as to the committee in reference to appropriations for the continuance of "Tests of Structural Materials." Arrangements for the Rowland Prize were referred to a committee to report to the Board.

Resolutions in reference to the death of the late President of the Society, Mr. Ashbel Welch, were received from the Board of Directors of the United New Jersey Railroad and Canal Company. Quarterly appropriations were made.

## CONTRIBUTIONS TO THE BUILDING FUND.

By a resolution of the Board of Direction, all contributions to the Building Fund are to be acknowledged, from time to time, by printing lists of the same in the monthly Proceedings of the Society, and in addition to this the names of all those who may subscribe \$100 or more are to be regularly enrolled and published in future lists of the Society under the head of Subscribers to the Building Fund, and they will be entitled to receive one copy of the monthly publications, comprising all papers and Transactions of the Society, regularly, for life, for each \$100 subscribed by them; such copies to be in addition to those which they may be already entitled to if they are Members or Fellows.

The following contributions are acknowledged in addition to those heretofore noted :

*S. S. Haight.....	\$10 00
S. Winery.....	25 00

## LIST OF MEMBERS.

## ADDITIONS.

## MEMBERS.

Date of Election.

BRADLEY, T. C.....	U. S. Asst. Engineer, St. Joseph, Mo....	Dec. 6, 1882.
FILLEY, H. H.....	Div. Engr. Mex. National Construction Co., Calle Cadena 11, Mexico, Mex....	Jan. 3, 1883.
FRITH, ARTHUR J.....	U. S. Asst. Engineer, Hotchkiss, Tenn..	" "
FRIZELL, JOSEPH P.....	104 East Third St., St. Paul, Minn....	" "
MANSFIELD, M. W.....	Engineer Maintenance of Way, P. C. and St. L. R. R., Richmond. Ind....	July 5, 1882.
PEGRAM, GEORGE H.....	(Elected Junior April 7th, 1880), Edg- moor Iron Co., Wilmington, Del.....	Jan. 3, 1883.

## JUNIOR.

LOWETH, CHARLES F.....	Care of Raymond and Campbell, Coun- cil Bluffs, Iowa.....	" "
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## CHANGES AND CORRECTIONS.

## MEMBERS.

BONNYN, WM. WINGFIELD.	Care Bank of Montreal, Halifax, N. S.
BURNS, EDWARD C.....	25 Washington Ave., Detroit, Mich.
DEMPSTER, ALEXANDER...	89 Fourth Ave., Pittsburgh, Pa.
ENGLE, ROBERT L.....	Res. Engr. Mexican Central R. R., El Paso, Texas.

\* Additional subscription to payments previously acknowledged.



- FOGG, CHARLES E.** ..... Div. Eng. South Penna. R. R., Harrisburg, Pa.  
**FRAZIER, JAMES L** ..... Louisville Bridge and Iron Co., Louisville, Ky.  
**GOLAY, PHILIP** ..... U. S. Asst. Engineer, Golconda, Ill.  
**GRANT, WILLIAM H.** ..... 1828 Jefferson Place, Washington, D. C.  
**HARRIS, WILLIAM P.** ..... Supt. West. Div. C. and O. R. R., Hinton, W. Va.  
**LINVILLE, JACOB H.** ..... 3608 Chestnut St., Philadelphia, Pa.  
**McKEOWN, THOMAS.** ..... Houghton and L'Anse R. R., L'Anse, Mich.  
**MCLAIN, LOUIS R.** ..... Div. Eng. R. and D. Ex. Co., Anniston, Ala.  
**MEYER, THOMAS C.** ..... 13 Waverly Place, New York City, N. Y.  
**NEWMAN, ROBERT M.** ..... Minneapolis, Minn.  
**OSGOOD, JOSEPH O.** ..... Chief Engr. Boston, Hoosac Tunnel and Western  
   R. R., Saratoga Springs, N. Y.  
**PALMER, FRANCIS I.** ..... 38 West Ninth St., New York City, N. Y.  
**PICKETT, WILLIAM D.** ..... 351 Nineteenth St., Denver, Col.  
**POST, JAMES C.** ..... Capt. of Engineers, U. S. A., 33 West Houston St.,  
   New York City, N. Y.  
**RUSLING, GEORGE M.** ..... New York, West Shore and Buffalo R. R., Lock Box  
   399, Rochester, N. Y.  
**SCHMIDT, MAX E.** ..... Al/c. Sr. Pedro del Hoyo, Ferro Carril Central, San  
   Luis Potosi, Mexico.  
**SEARLES, WILLIAM H.** ..... Beach Creek, Clinton Co., Pa.  
**STRIEDINGER, JULIUS H.** ... (Care Am. Soc. C. E.), 127 East 23d St., New York  
   City, N. Y.  
**VAN BROCKLIN, MARTIN**... Minatitlan, Mexico.  
**WARD, CHARLES D.** ..... 314 York St., Jersey City, N. J.  
**WISNER, GEORGE Y.** ..... 39 Canfield Ave., Detroit, Mich.

**JUNIOR.**

- WEBSTER, ALBERT L.....P. O. Box 240, Salt Lake City, Utah.**

FELLOW.

- CHENEY, NATHANIEL** . . . . . 201 Broadway, New York City, N. Y.

**DEATHS.**

- CARY, EDGAR SHELDON....Elected Member November 1st, 1882. Died January 5th, 1883.
- ELLIS, THEODORE GRENVILLE (*Past Vice-President and Fellow of the Society.*) Elected Member February 17th, 1869. Died January 9th, 1883.
- FOWLER, CHARLES EDWARD.Elected Member May 3d, 1876. Died January 28th, 1883.
- MORLEY, WILLIAM RAYMOND.Elected Member September 6th, 1882. Died January 3d, 1883.

# American Society of Civil Engineers.

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## PROCEEDINGS.

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Vol. IX.—April, 1883.

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### MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

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#### OF THE SOCIETY.

MARCH 7th, 1883.—The Society met at 8 P. M., Vice-President Wm. H. Paine in the Chair; John Bogart, Secretary. Ballots for membership were canvassed, and the following candidates were declared elected :

As Members : Henry Delphos Gates, San Francisco, Cal. ; Gustave Lehlbach, Newark, N. J.

As Junior : William Jewett Haskins, New York City.

Votes for the proposed amendments to the Constitution were canvassed, with the following result :

Total number of votes received.....	134
Deduct without endorsement.....	1
Not entitled to vote.....	1

— 2

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Total number of ballots counted..... 132

On the following proposed amendment to Article XXXIII :

Proposed amendments to this Constitution must be submitted in writing, signed by not less than 5 members, on or before the first Wednesday in November, and shall be sent by letter to the members of the Society, at least 25 days previous to the Annual Meeting.

Such amendments shall be in order for discussion at such Annual Meeting, and may be amended in any manner pertinent to the original amendments by a majority vote of the Annual Meeting, and if so amended, shall be voted upon by letter-ballot in form as amended by the Annual Meeting; if not so amended, they shall be voted upon by letter-ballot as submitted; the vote to be counted at the first regular meeting in March.

An affirmative vote of two-thirds of all ballots cast shall be necessary to the adoption of any amendment.

There were in the affirmative..... 107 votes.

“ “ “ “ negative..... 8 “

[NOTE.—17 ballots had no vote entered upon this amendment.]

This proposed amendment, having received two-thirds of all ballots cast, was declared adopted.

A.—On the following proposed amendments to Article XXII.:

Add at end of Article as follows :

Any member of the Society, not in arrears for dues, may compound for future annual dues by the payment of Two Hundred and Fifty Dollars ; provided, however, that each person duly elected a member shall pay the entrance fee and also the annual dues for the current year of his election.

Provided, also, that any member desiring to compound for future annual dues shall have paid the annual dues for a current year before the compounding sum may be available.

Provided, also, that in addition to the sum provided for compounding dues, there shall be paid by each compounding member resident within 50 miles of the Post Office in the City of New York, the sum of Ten Dollars per year for 5 years after compounding.

Should a resident member become non-resident at any time during the 5 years after compounding, he shall be relieved from the payment of such annual sums during the time of non-residence.

Should a non-resident member become resident at any time within 5 years after compounding, he shall be liable to the annual payment of Ten Dollars for each year of residence up to 5 years after compounding.

Members compounding shall sign an agreement that they will be governed by the Constitution and By-Laws of the Society as they are now formed or as they may be hereafter altered, amended or enlarged; that in case of their desiring to withdraw their names from the roll of the Society, the amount theretofore paid by them for compounding and for entrance fees and annual dues shall be the property of the Society; that in case of expulsion, the amount paid for compounding shall be returned to the expelled member, but not the amount theretofore paid for entrance fees or for annual dues.

B.—Amendment adopted and recommended by Annual Meeting:

Add at end of Article XXII. as follows :

Any member of the Society, not in arrears for dues, may compound for future annual dues by the payment of Two Hundred and Fifty Dollars ; provided, however, that each person duly elected a member shall pay the entrance fee and also the annual dues for the current year of his election.

Provided, also, that any member desiring to compound for future annual dues shall have paid the annual dues for a current year before the compounding sum may be available.

Provided, also, that in addition to the sum provided for compounding dues, there shall be paid by each compounding member resident within 50 miles of the Post Office in the City of New York, the sum of Ten Dollars per year for 5 years after compounding.

Should a resident member become non-resident at any time during the 5 years after compounding, he shall be relieved from the payment of such annual sum during the time of non-residence.

Should a non-resident member become resident at any time within 5 years after compounding, he shall be liable to the annual payment of Ten Dollars for each year of residence up to 5 years after compounding.

Members compounding shall sign an agreement that they will be governed by the Constitution and By-Laws of the Society as they are now formed or as they may be hereafter altered, amended or enlarged; and that in case of their ceasing to be members from any cause whatever, the amount theretofore paid by them for compounding and for entrance fees and annual dues shall be the property of the Society.

The votes were as follows :

" Amendment A ".....	10
" Amendment B ".....	81
" No " (that neither be adopted).....	32
" Yes ".....	2
" A or B ".....	3

[NOTE.—4 ballots had no vote entered upon these amendments.]

It was decided that neither of these proposed amendments had received two-thirds of all ballots cast, and that, therefore, neither was adopted.

C.—On the following proposed amendments to the Constitution :

A new Article :

Whenever 20 or more members shall signify their desire to form a section of the Society for the advancement of a special branch of engineering, the Board of Direction shall consider such application, and submit it, with an expression of opinion, to the Society for a letter-ballot. The application shall be granted if two-thirds of the votes be in the affirmative.

Sections authorized as above shall have the privilege of separate meetings for reading of papers and discussions, at times and places determined by themselves, but may not assume to transact business in the name of the Society.

The transactions of sections shall be published by the Society, under the usual regulations; but no expense other than for such publication shall be borne by the Society.

D.—Amendment adopted and recommended by Annual Meeting:

A new Article :

Whenever 10 or more members of the Society shall signify their desire to form a section of the Society for the advancement of engineering, or of any special branch thereof, the Board of Direction shall consider such application, and submit it, with an expression of opinion, to the Society for a letter-ballot. The application shall be granted if two-thirds of the votes be in the affirmative.

Sections authorized as above shall have the privilege of separate meetings for reading of papers and discussions, at times and places determined by themselves, but may not assume to transact business in the name of the Society.

The transactions of such sections may be published by the Society, under the usual regulations; but no expense other than for such publication shall be borne by the Society.

The votes were as follows :

" Amendment C ".....	24
" Amendment D ".....	80
" No " (that neither be adopted).....	24
" C and D ".....	2

[NOTE.—2 ballots had no vote entered upon these amendments.]

It was decided that neither of these proposed amendments had received two-thirds of all ballots cast, and that, therefore, neither was adopted.

The following letter was submitted by the Board of Direction for consideration :

ANN ARBOR, Dec. 19th, 1882.

JOHN BOGART, Esq.,

*Sec'y Am. Soc'y Civil Engineers,*

New York City:

DEAR SIR : I beg leave to call your attention—and, through you, the

attention of your Society—to the following resolutions adopted by the Engineering Society of the University of Michigan at the meeting of Dec. 8th, 1882 :

“ *Whereas*, It is deemed advisable by the majority of the Schools of Technology to give the degree of Civil, Mining and Mechanical Engineer as second degrees ; and

“ *Whereas*, No uniform degree distinctive of the course of study pursued is now conferred upon graduation ; therefore,

“ *Resolved*, That this Society request the Faculty to confer with the faculties of other engineering schools, and to secure, if possible, the general adoption of an appropriate degree to be conferred upon graduation ; also,

“ *Resolved*, That this Society correspond with similar societies, and with engineering students of other schools, for the same purpose.”

In accordance with the above, I have addressed a circular to the societies and students of most of the highest Schools of Technology in the United States, and have written to the American Societies of Mining and Mechanical Engineers.

As the American Society of Civil Engineers was so largely instrumental in securing the present elevation of the full Engineer's degree to the rank of second degree, and the consequent rise of standard, we venture to call attention to this matter, and respectfully ask for your consideration, and, if possible, your help.

We feel sure that such uniformity, especially if it can be accomplished by a practically equivalent course of study for such a degree in all schools conferring it, will raise the standard of the young engineers entering the profession.

Will you be kind enough to let us know whether your Society will probably take action in this matter or not, and if so, how long before it can be done ?

Very respectfully,

for the Engineering Society,

FRANK M. DUNLAP,

*Cor. Sec'y.*

CHARLES E. EMERY.—I do not see how a matter of this kind can well be taken up by us as a Society, but I suggest that a committee might be appointed to confer with other societies, and with the representatives of educational institutions.

JOSEPH P. DAVIS.—This Society, I think, has not heretofore taken action upon such a matter.

The SECRETARY.—Not that I am aware of.

WILLIAM P. SHINN.—I would suggest that it is out of the ordinary course of such things, in their application to other branches of study, that a college should confer a degree which is a business title, and it has

struck me for a long time that it is as much out of the way for colleges to confer the title of civil engineer, as for a law school to confer the title of attorney-at-law. It does not make him an attorney-at-law, and no more does the title make a man a civil engineer. A considerable amount of practice is required before he gets to that point. Of course it would only lie in the province of this Society to recommend some action, and I think it would be a good thing to put ourselves on record as regards the matter.

On motion of Mr. Shinn, it was—

*Resolved*, That a committee of three be appointed to confer with the American Institute of Mining Engineers, and the American Society of Mechanical Engineers, and with authorized representatives of Institutions of Technical Education upon this subject, and report the result to the Society.

The following members of the Society were appointed such committee: Messrs. Wm. P. Shinn, T. C. Clarke and Theodore Cooper.

A paper by Hamilton Smith, Jr., M. Am. Soc. C. E., on the Flow of Water in Pipes, was then read and discussed by Messrs. T. C. Clarke, Croes, Cooper, J. P. Davis, Emery, North, and Wm. H. Paine.

MARCH 21st, 1883.—The Society met at 8 P.M., Vice-President William H. Paine in the chair; John Bogart, Secretary. The death on March 8th, 1883, of Mr. James O. Morse, M. Am. Soc. C. E., was announced. Mr. Morse became a member of the Society February 9th, 1853. He was its Secretary from December 1st, 1854, to November 3d, 1869, and its Treasurer from December 1st, 1854, to November 3d, 1875. After remarks by the Secretary referring to the important work done for the Society by Mr. Morse during the long period of his connection with it, the President was authorized to appoint a committee to prepare a memoir for publication in the Proceedings.

The subject of Tests of Iron, Steel and other materials was then considered. By request of the Chair, it was introduced by the Secretary.

The SECRETARY.—I suppose that the facts connected with this subject are generally understood in this Society, but in order to introduce the proposed discussion, I may say that this question of tests of structural materials has been for a long while a matter of very great interest to a large proportion of our members. The work of the United States Board to test iron, steel and other materials is very well known. The great testing machine built under the auspices of that board is now at the Watertown Arsenal, and is in charge of the Ordnance Department of the United States Army. After the United States Board on that subject ceased to exist, the work of continuing tests of structural materials has been carried on by the Ordnance Department, but only with very meagre results, because the amount of money appropriated by Congress and used for this purpose has been very small. The necessity for the resumption and continuance of this work has been more and more deeply

impressed upon the minds of engineers, producers and users of structural materials, and it became apparent that in the interests of proper construction some action must be taken upon the subject. At the meeting of the American Institute of Mining Engineers at Washington, there occurred a most interesting discussion upon this matter, participated in by a number of members of that Institute, and also of this Society. At the Annual Convention of the American Society of Civil Engineers in 1881, a special committee was appointed to report to the Board of Direction, and at the annual meeting of the Society in 1882 the Board of Direction presented a report, including with it the report of this special committee. At that annual meeting the Board of Direction was authorized to memorialize Congress and to promote, as far as was properly practicable, the passage of a law creating a commission to test structural materials. A bill to that effect was prepared in consultation with many persons interested in the subject, and was presented in Congress, and the action of the Board was reported to the Society. The President of the Society, the late Ashbel Welch, members of the Board of Direction, and other members of the Society, with friends of the measure, visited Washington, and endeavored to secure the passage of that bill. The effort was unsuccessful. There was, however, at that session of Congress introduced into the Army Appropriation Bill a clause in reference to this subject, authorizing the Chief of Ordnance to give attention to a programme of tests to be prepared by civil engineers. It is proper that I should say that that clause was introduced with the entire concurrence of the Chief of Ordnance of the United States Army, and that, with his concurrence, an effort was made to secure a larger appropriation than the \$10 000 which had been appropriated previously for the annual care and use of the machine at Watertown. The effort to secure a larger appropriation was not successful, but the clause in reference to the preparation of a programme became a part of the law. In an interview with the Chief of Ordnance, that officer expressed to a number of engineers a deep interest in the successful prosecution of such tests of structural materials as would secure the information that engineers desire, and he earnestly and cordially requested the aid of the civil engineers of this country in the preparation of such a programme of tests and the suggestion of such a use of the machine and of other suitable methods as would secure the best practicable results. In accordance with the clause of the bill referred to above, the Board of Direction called to its aid, by correspondence and in personal consultation, a number of persons, members of this Society and of the American Institute of Mining Engineers, and the American Society of Mechanical Engineers, and with their assistance a programme was prepared which aimed to secure as good results as were practicable with the small amount of money appropriated. The programme, so prepared, has been accepted by the Chief of Ordnance and has been issued in a circular form, and is now published in our Proceed-

ings. At the recent meeting of Congress, an effort was again made to secure a larger appropriation for the coming fiscal year than the \$10 000, which had been the sum annually appropriated, and which was really too small to accomplish very much. At the recent annual meeting of the Society the subject was discussed, and a committee was appointed to assist in the endeavor to secure a more liberal appropriation. The Chairman of that Committee, Mr. Chanute, is present, and will give us a statement of what has been done, and what the present state of the matter is.

Only one additional point I desire to refer to. In the original draft of the addition to the law which I have mentioned, it was provided that the record of tests should be published by the Government. Members of Congress saw fit to amend this by substituting a requirement that the records of tests should be furnished this Society, to be by it published at its own expense. This was not requested by the Society, but it has been imposed upon us by law. The Board of Direction therefore proposes to publish these records in the monthly Proceedings, and also to furnish printed copies of them in such form as will secure their full circulation among all who are interested in the subject, giving them every possible publicity. I now ask Mr. Chanute to tell us the present condition of this important subject.

O. CHANUTE.—Mr. President: Immediately upon being notified of its appointment, your committee entered into communication with the Chief of Ordnance, in order to ascertain the actual condition of affairs, and to secure the benefit of his advice and co-operation.

He was very prompt and very kind, and wrote at once to advise your committee that the "Book of Estimates" had contained (page 149) the following items:

Caring for, preserving, using and operating the U. S.

Testing Machine, at Watertown Arsenal..... \$10 000

Purchase of materials for specimens, and labor to prepare them..... 13 500

But that in the Army Appropriation Bill, which had then (Feb. 6) passed the House, only the first item had been included. That in the Senate, where it was then pending, a clause similar to that of last year had been added, providing that the Chief of Ordnance should give attention to a programme of tests to be submitted by the American Society of Civil Engineers, but the amount appropriated had been left the same (\$10 000). He suggested that letters should be written to several members of Congress whom he named, in order to advocate a larger appropriation.

I should here explain that, as a rule, it is almost impossible to secure appropriations for work to be done under Government auspices unless these have been previously and duly asked for by the department in charge, in its estimates of expenditures required for the ensuing year. It is very easy to get less, but almost impossible to obtain more than is



thus included in the "Book of Estimates." In this case the book had also included the following items :

For a machine for testing the torsional resistance of material .....	\$50 000
For a machine for testing the transverse resistance of material .....	50 000

Neither of which were included in the appropriations which were passed.

It having been suggested that in the then crowded condition of the public business, letters would be more efficacious than personal interviews, your committee wrote to several members of Congress to advocate a larger appropriation than the \$10 000 then pending. In these letters it was pointed out that under the action already obtained, and the circular issued by the Chief of Ordnance on the 19th of January, it was highly probable that the bridge builders, the railroad companies, and the manufacturers of the country would this year furnish at their own expense some \$40 000 worth of materials to be tested with the \$10 000 appropriated by Congress (it being generally found that the testing proper costs about  $\frac{1}{4}$  as much as the materials), but that in order to connect the various experiments into a harmonious series, some intermediate specimens would have to be provided, and for this your committee suggested that the \$13 500 asked for in the "Book of Estimates" should be appropriated.

Unfortunately, Hon. Abram S. Hewitt, who proved so powerful a friend to this appropriation the preceding year, was ill in New York, and although he was seen by your committee, and wrote in its behalf to Washington, he was not able to resume his seat in Congress before the end of the session, and his personal influence could not be exerted.

Capt. Michaelis, member of the Society, and one of your committee, however, went to Washington, had personal interviews with some members of Congress, appeared before one of its committees, and endeavored to have this increased appropriation included either in the "Army Bill," or in the "Sundry Civil" Appropriation Bill.

Mr. L. L. Buck, member of this Society, who chanced to be in Washington, also made an effort to interest members of Congress in the subject. I see that he is present here to-night, and I hope that we shall hear from him on the subject.

All these efforts proved fruitless, and we are now advised that the only appropriation obtained for tests this year was in the Army Appropriation Bill, and is in these terms :

"UNITED STATES TESTING MACHINE.—For caring for, preserving, using and operating the United States testing machine at the Watertown Arsenal, ten thousand dollars : *Provided*, That the tests of iron and steel and other materials for industrial purposes shall be continued during the next fiscal year, and report thereof shall be made to Congress : *And provided further*, That in making tests for private citizens,

the officer in charge may require payment in advance, and may use the funds so received in making such private tests, making full report thereof to the Chief of Ordnance ; and the Chief of Ordnance shall give attention to such programme of tests as may be submitted by the American Society of Civil Engineers, and the record of such tests shall be furnished said Society, to be by them published at their own expense."

As the machine has to be taken care of, and the Government work first done, out of this appropriation, it is doubtful whether even so much as half of it will be available for the programme of tests already suggested by this Society.

It is much to be regretted that the amount appropriated is so small, as this is likely to cripple the efficiency of the programme, and to discourage intending contributors of material at the very start.

Of course we must make a fresh effort for an appropriation next year, but pending this, I believe that the thing before us now is to accomplish the greatest possible results with so much as can be spared from the sum already appropriated, be it \$3 000 or be it \$6 000. As I have already intimated, I believe we can obtain gratuitous contributions of about \$40 000 worth of material and specimens to be tested, as I understand that bridge builders are generally preparing to get up a series of compression members for testing, and several large corporations (that with which I am connected among the number) have authorized the ordering of duplicate parts of some of their bridges in process of construction, in order to send them to Watertown to be tested.

I think that the thing for us to do, therefore, is to endeavor to accomplish some tangible results now, and to try to secure a larger appropriation next year.

I understand, however, that there are some obstacles in the way. The first is said to be the opposition of a certain member of Congress from the West, who is likely to occupy an important position in the next Congress, and who has an idea that tests of structural material will be of no particular benefit to the country at large, or, at most, of benefit only to the Eastern manufacturing States, and who opposes an appropriation. I think this mistaken idea of his (if it be true that he entertains it) can be entirely removed if some Western member of our Society in whom he has confidence will take the pains to explain the importance and value of the tests which we propose, and which can only be carried on with the Government machine. I think it can be clearly shown that by giving engineers, designers and builders a better knowledge of the strength and behavior of the full-sized sections which they are using, and which have not been tested hitherto for lack of a sufficiently powerful machine, we are likely to save the metal users of the country each year much more than the experiments will cost in the aggregate. I believe for myself that, in comparison with the strength of the tensile members of our structures, we are putting an undue proportion of material in the compression

members, and that our bridges, roofs and other structures are not yet of uniform strength throughout.

Perhaps another obstacle to an appropriation this year was the fact that \$100 000 was asked for to build two new machines, and that this was pressed at Washington by the inventor of the present machine, who desires to build these also, and who, in asking for such a large sum, may have deterred the members of Congress from granting anything.

It seems to me that we ought to be able to point to some adequate and practical results from the use of the present machine, and from the little bit of money appropriated, before we urge the building of more machines. We do, however, want a larger sum than \$10 000 for testing, and I believe that with proper effort we can procure the appropriation of any reasonable amount next year, provided we can show some valuable results this year. A good many tests have already been made in an irrelevant sort of way, and more are making every day, but engineers thus far seem to have drawn no particular deductions from them. Now, will not some of you analyze these experiments, and see if there is any value in them, and whether some general conclusions can be deduced from them that will have a practical bearing on the use of metal? As I have stated already, I believe we are putting an undue proportion in our compression members, but until this is proved to be the fact, by experiment on full-sized members, I shall feel safer by adhering to the current practice.

With a view to inducing some of you to undertake such a task, I have brought here to-night a set of the Government publications of the tests thus far made, and which engineers have been complaining could not be procured. I beg to present them either to the Society, or to any member who will undertake to digest them.

I think, in addition, that it is desirable to secure some concert of action between intending contributors of specimens, in the preparing and sending forward compression members to be tested, both to prevent too much duplication of parts having the same dimensions, and to preserve some co-ordination in the series of tests. I propose, therefore, that we should appoint a committee to draw up a programme, under which the tests may be carried on, and I hope that in the discussion which is about to follow the members will fully express their views, and endeavor to bring about concert of action in a matter which promises such good economical results for the country at large.

L. L. BUCK.—I have very little to say. I was in Washington in February, and received a telegram asking me to go before a committee with Captain Michaelis. I consented, but did not meet the committee, through some misapprehension. I afterwards received a letter from Captain Michaelis, and I wrote on the subject to some members of the Senate and talked with some, but it was too late to effect anything.

O. CHANUTE.—I would ask Mr. Buck if he ascertained what was in the way of getting the appropriation ?

L. L. BUCK.—I hardly can say. I think a good many were in favor of it, but there was not sufficient interest felt.

T. C. CLARKE.—I think one of the principal reasons that appropriations for tests have failed to be carried is on account of the indifference of Congress. Nobody cares about it. On general principles, it will be said it is a very good thing, but no member takes a special interest in it. Now, we ought to take such steps as will show members of Congress how necessary this is. In other words, advertise it. We must in some way or other get it before the public—get it talked about—get it into the public mind, that it is a necessary thing to be done. .

L. L. BUCK.—Some members of Congress should be interested in the matter ; otherwise it will be very hard to effect it.

A. P. BOLLER.—The only way to properly operate in this matter of tests, is for the committee to devise a scheme under which they will be conducted. For early results, simple sections are necessary. Inasmuch as compression members seem to be the direction in which experimenting had best be done, growing out of the admirable commencement on Phoenix columns, it would be well to make a series of tests on channel-iron, beams, angles and tire-irons, under the conditions they are used in practice. Such sections are readily obtained on demand from any rolling mill, can be rapidly tested, and the records put before the scientific and manufacturing world more quickly than any other range of experiments. They would be extremely valuable, and if performed in a proper series, would settle for all time the constants in all column formulæ for such sections.

The SECRETARY.—It seems to me that the suggestions that have been made in regard to the appointment of a committee are prudent, and will provide a means of securing future results. I suppose that such a committee may be expected to show that even with the very small amount of money used so far, good results have been obtained.

Perhaps the way to secure the appointment of a committee for that purpose would be to give to the Board of Direction the power to appoint such a committee.

CHARLES MACDONALD.—I supposed that there had been a committee appointed from the fact that some time ago I received a circular asking how such tests should be made, but if this is not the case, I should favor the formation of a committee as suggested. Such committee, by making personal application to parties who are interested in the manufacture of compression members, could doubtless obtain the promise of a class of specimens for testing which would fairly represent their own practice. I have myself had drawings prepared representing columns having a range of from 15 to 60 diameter, pin bearing at each end, and having different sized pins. These I would be glad to furnish to the committee.

If a sufficient number of such drawings could be obtained, representing as they would the most approved practice of the different designers, the committee might be able to suggest many desirable modifications, and thus organize the work so as to reduce expense and prevent a multiplication of useless experiments.

The SECRETARY.—Mr. President, I would say in reply to the question as to a previous appointment of a committee, that the subject was referred by the Society to the Board of Direction; that the Board acted in consultation with a number of engineers, and that the programme which was submitted to the Chief of Ordnance was prepared from the advice and suggestions of these engineers. That programme has been issued by the Chief of Ordnance as follows:

AMERICAN SOCIETY OF CIVIL ENGINEERS, }  
127 EAST TWENTY-THIRD STREET, N. Y., }  
December 23, 1882. }

General S. V. BENÉT,  
*Chief of Ordnance, U. S. A.,*  
*Washington, D. C.*

DEAR SIR: The Board of Direction of the American Society of Civil Engineers has had under careful consideration the subject of the preparation of a programme of tests of structural materials, to be submitted to you, in accordance with the provisions of the last Army Appropriation Bill. In this duty the Board, through its President and Secretary, has consulted a number of persons interested in the investigation, production, and use of structural materials, and including not only members of this Society, but also members of the American Institute of Mining Engineers, and of the American Society of Mechanical Engineers.

In response to a letter on the subject, a number of replies have been received, an abstract of which has been compiled, and a copy of which abstract is at your service.

Some delay has occurred in communicating with you. This delay has been occasioned by the illness and death of our late President, Mr. Ashbel Welch, who was chairman of the committee having this particular matter in charge, and who was about to call upon and consult with you when prevented by his last illness.

A number of the gentlemen interested in this subject recently met, and after considering all the suggestions that had been received, brought into practical shape a general programme, which the Vice-President of this Society informally submitted to you a few days since. In accordance with your suggestion at that time, there is presented to you herewith this programme.

#### PROGRAMME.

Congress has appropriated the sum of ten thousand dollars for "carrying for, preserving, using and operating the United States Testing

Machine at the Watertown Arsenal " for the fiscal year ending June 30, 1883.

In order to produce the largest immediate results with the small amount appropriated, we suggest that the investigation be limited this year to the compression members of structures, and that co-operation be invited from railroad companies, bridge engineers, architects, and manufacturers and users of structural material strained in compression.

For this purpose we suggest that the Ordnance Department of the United States Army should offer to pay the freight on and to test duplicate compression members, either from structures which such parties may have in progress of construction, or special shapes prepared for this purpose, provided the same be furnished free of further cost.

If the parties will cause to be manufactured one or more duplicate compression parts from each bridge or structure which they may undertake hereafter, or will furnish special shapes, varying in proportions, preferably in series from twenty to sixty diameters, and varying by increments of five diameters; or if they will manufacture special shapes which they desire to have tested; if they will also furnish at least three small or hand specimens of the same material, prepared as indicated in the note below;\* if they will place these parts and pieces, free of cost, on board of some transportation line, obtaining the lowest available rate of freight to Watertown Arsenal, and notify the Chief of Ordnance of the particulars of shipment, also furnishing, so far as they can, a statement of the composition of the metal and its process of manufacture, and a diagram showing the position the member is intended to hold in the structure, and the computed strain it is expected to bear, that then the Ordnance Department will:

1. Pay the freight on the shipment from the initial point to Watertown Arsenal.
2. Test the compression pieces in due course, as well as the hand specimens.
3. Account to the shipper for the value of the scrap, if required, when the same is sold, or return the same to the shipper, if preferred, paying the freight from Watertown.
4. Furnish the shipper an early special report of results of the tests of all pieces sent by him, giving him an opportunity of sending a second piece to cover any defects that may have occurred.

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\*These three or more small or hand specimens to be of the same material as the compression member furnished; to be rectangular, and to be reduced to one-half of one square inch in area of section; to be of the same thickness as that used in the construction of the member, unless that thickness should exceed one inch, in which case the small specimen is to be reduced to one inch.

It is desired as far as practicable to shape these specimens from pieces of the same section as those composing the member, preserving the surfaces as they come from the rolls, excepting the removal of the outer scale.

The length of these specimens should be two feet.

5. Furnish the American Society of Civil Engineers promptly, for publication and distribution, full copies of all tests and information obtained therefrom.

Respectfully submitted,

W. H. PAINE,  
*Vice-President Am. Soc. C. E.*  
 JOHN BOGART,  
*Secretary Am. Soc. C. E.*

General Benét then printed that programme in full, and issued it with the following letter upon the first page:

ORDNANCE OFFICE, }  
 WAR DEPARTMENT, }  
 WASHINGTON, January 19, 1883. }

DEAR SIR: The last Army Appropriation Bill, in the item appropriating \$10 000 "for caring for, preserving, using and operating the "U. S. Testing Machine at the Watertown Arsenal," provided as follows:

"And the Chief of Ordnance shall give attention to such programme "of tests as may be submitted by the American Society of Civil Engineers, and the record of such tests shall be furnished said Society, to "be by them published at their own expense."

In the furtherance of this object the Society of Civil Engineers have addressed to me the accompanying letter. I concur fully with the Society in the terms of their programme, believing them to be most equitable, in view of the small appropriation now available.

If parts and pieces, free of cost, are placed on board of some transportation line, and sent to the Watertown Arsenal, Watertown, Mass., at the lowest rate of freight, &c., &c., furnishing this office a statement of the composition of the metal and the process of manufacture, &c., this Department will pay the freight, test the pieces, account for scrap, furnish early reports to the sender, and to the Society of Civil Engineers for publication.

Very respectfully,

Your obedient servant,

S. V. BENÉT,  
*Brig.-Gen., Chief of Ordnance.*

The above programme and letter have been sent by the Chief of Ordnance to every member of the American Society of Mechanical Engineers, the American Institute of Mining Engineers, and of this Society, and also to officers of railroads, and to manufacturers of structural materials.

A. P. BOLLER.—It is extremely important that such columns as may be sent should conform to a series, that had best be arranged by the committee, so as to induce harmony in the experiments. Isolated columns yield no positive information, further than for precisely similar

cases. The experiments, to have a real working value, should be so conducted as to permit of systematic generalization, or they will prove of very little account.

CHARLES E. EMERY.—That programme indicates a series.

The SECRETARY.—It particularly speaks of a series.

A. P. BOLLER.—I did not so understand the programme while being read. The idea I wish to emphasize is, that the committee should so communicate with the manufacturers that all parties may work on a uniform system. So that all comparisons between the productions of various manufacturers shall be absolutely on the same basis.

THEODORE COOPER.—In regard to the point of originating and carrying out tests, I am prepared to endorse it, but as to Mr. Chanute's suggestion of framing a general programme, I want to object. The worst of it with our past committees was that they wore out all their energies with programmes. Let us get the tests that we started out to obtain actually made, then go before Congress and stand on the results we can show. It is wasting our energies by asking for programmes. Such a course will get us nothing.

O. CHANUTE.—I did not propose, when suggesting a committee to prepare a programme, such a programme as Mr. Cooper has discussed and opposed. My idea was much more limited. In order that we may not get more or less discordant results, we should each of us send different duplicate members of the structures which we are building. Otherwise the result will be a want of homogeneousness in the experiments; and my idea as to the committee is that it should endeavor to bring about such concert of action among the various parties who may contribute specimens as to leave no great gaps in the experiments. This may be effected either by requesting the contributors to select such compression members as to form harmonious series of tests, or, as I put it to the members of Congress, by obtaining specimens which will fill up the missing links, at the expense of the Government.

There is one point of view so important that I cannot insist on it too often. It is that we should endeavor before the next session of Congress to show some practical results from what experiments have been tried, and that some general deduction should be drawn from these experiments in order to show their value.

THEODORE COOPER.—There is one point about the appropriation of \$10 000. That appropriation is for this year only. It expires on the 1st of July. Now the first duty that should be urged upon the manufacturers is to get their materials to be tested forwarded inside of the year—otherwise we can get no benefit from them.

A. P. BOLLER.—That was the view I had, and my idea was that with a little energy the whole series of specimens of iron, steel, &c., could be got to Watertown in a very short time, and the results of the tests of the series would soon show.



CHARLES E. EMERY.—Is the appropriation for the present year?

The SECRETARY.—Ten thousand dollars for each year; but there is a large amount of work to be done with the Watertown machine outside of that which we suggest to them. There is certain Government work which will use up part of the \$10 000. It is to be used in testing materials, &c., for Government purposes. Nevertheless, I know that the Chief of Ordnance desires as much as possible of the money to be applied to the prosecution of the programme proposed.

A. P. BOLLER.—The Board is fully empowered to act.

The SECRETARY.—The Board has power now, but I am sure that the Board will listen gladly to the suggestions made here this evening.

CHARLES E. EMERY.—I have not had experience in this particular direction, but I have made experiments in two entirely different branches of experimental research. I hoped to get at some results, but the fact was that experiments were made in such a way that it was necessary to reject very many, and in this case, if individuals are to send specimens made in accordance with their particular hobbies, then in our Proceedings there will be such a mass of evidence that it will be hard to digest it. It seems to me that some programme should be fixed upon, and that rather than do nothing, the work should be confined to some particular thing; for instance, say to columns formed of independent straight members, connected by lattice work. That may not be the best subject, but the point I wish to enforce is, that while it may be well to allow this individual action to cover the ground in the general interest, yet some particular thing should be set before them. I would suggest to the committee, but not move to give instructions definitely, that special efforts be directed to effect a series of experiments of tests on columns.

The CHAIR (Vice-President WILLIAM H. PAINE).—I would like to make a remark. When this subject of a programme came up before the gentlemen that were invited to meet here and discuss the various letters that had been received, and which had become voluminous, there were a good many things to be thought of. For instance, there was only \$10 000 appropriated—a part of the year had already past. They were obliged to call for contributions either of money or materials to test, and if they were very particular and only called for some definite shapes and sizes they feared that they might fail to get parties to give freely without cost to the Society or to the Government. This subject was thought of a great deal by the committee. Our late President made a study of it. The trouble was to reduce the programme to a size commensurate with the small amount of work that could be done this year. I think Mr. Welch's ideas were that as we advanced we would enlarge our programme, and would have it grow from year to year. Mr. Chanute has represented Mr. Welch's ideas in the main, but I do not think he intended to say that a very large programme should now be made out to cover all future action.

It seems necessary that we should have some results so as to move Congress, but this alone will only reach certain members of Congress, and that number will be very small. Some will only be influenced by personal appeals, and every member should use his influence to that end. I believe we ought to educate those members up to the importance of the movement.

There are members in the West who are evidently opposed to us.

T. C. CLARKE.—Members of Congress?

The CHAIR.—Yes, certainly, members of Congress, not members of the Society, in the West, who are opposed to us, and I think we ought to make them better acquainted with the subject.

R. L. HARRIS.—These remarks seem to be pertinent. There was a circular sent out a year ago requesting every member to speak to their representatives in Congress on this question. I was traveling at the time, and wherever I went I spoke to members of the Society about this matter, who promised to speak to the representatives in Congress from the district to which they belonged. If this thing was carried out, it seems to me, Mr. President, that it would produce good and wide-spread results.

The following resolution was then offered by Mr. Chanute, and seconded:

*“Resolved, That it is the sense of this meeting that a special committee of five should be appointed by the Board of Direction to prepare and promote such a programme of tests of structural material as to secure the best results possible from the Watertown Arsenal Experiments.”*

THEODORE COOPER.—This is proposing a committee to prepare a programme. I suggest that it be confined to carrying out the programme already adopted by the Society.

The CHAIR.—The resolution has been regularly seconded.

On a vote it was adopted.

APRIL 4TH, 1883.—The Society met at 8 P. M., Director George S. Greene, Jr., in the chair; John Bogart, Secretary.

The Secretary announced the progress of arrangements for the approaching Convention to be held at St. Paul and Minneapolis, Minn., beginning June 20th, 1883.

Ballots were canvassed, and the following candidates declared elected: As Members, Thomas Appleton, Council Grove, Kansas; O. H. P. Cornell, Schenectady, N. Y.; George H. Elliott, Norfolk, Va.; Orville Grove, Houston, Texas; William G. Williamson, Martinsville, Va. As Juniors, Frank L. Fuller, Boston, Mass.; Hunter McDonald, Nashville, Tenn.

The death, at 3 A. M. of the morning of this meeting, of Mr. Peter Cooper, was announced by Mr. Charles Macdonald, M. Am. Soc. C. E., who said, in addition, that it was hardly necessary at this moment to speak as to the merits of Mr. Cooper. It is sufficient for us to remember him as a man deeply interested in the application of science; a man

who should be recognized as having done more to educate men up to what true science is than any other man in the United States, or in the world at large.

He has been a public benefactor, not only to men who seek a higher education, and work with their brains alone, but to working men generally—men who work with their hands and brains. I move that an appropriate notice be entered on the minutes of this Society.

The motion, being seconded, was put and carried.

A paper by G. Y. Wisner, M. Am. Soc. C. E., on Geodetic Field Work, was, in the absence of the writer, read by the Secretary, and discussed by Messrs. Croes, Geo. S. Greene, Jr., Haight and Prindle.

APRIL 18TH, 1883.—The Society met at 8 P. M., Vice-President William H. Paine in the chair; John Bogart, Secretary. The deaths were announced of Mr. John Collinson James, M. Am. Soc. C. E., of Winnipeg, Manitoba, and of Mr. Simeon Sheldon, M. Am. Soc. C. E., of Cleveland, Ohio.

A paper by the late William R. Morley, M. Am. Soc. C. E., on the Proper Compensation for Railway Curves on Grades, was read by the Secretary, and discussed by Messrs. Chanute, T. C. Clarke, Emery, Forney, North, William H. Paine, C. D. Ward and L. B. Ward.

## OF THE BOARD OF DIRECTION.

MARCH 7TH, 1883.—Applications were considered. Financial business was transacted.

MARCH 14TH, 1883.—Upon the report of the special committee, transmitting correspondence with Messrs. Fteley and Stearns, joint authors of the paper to which the Norman Medal for the past year was awarded, and also with the Superintendent of the Mint at Philadelphia, it was determined that one gold medal of the full ordinary value should be struck and inscribed with the names of the joint authors, and that two certificates should be engrossed stating the fact of the joint award, and one of these certificates should be presented to each of the authors. The special committee upon the arrangement of the conditions and mode of award of the Rowland Prize instituted by the Society reported that, after consultation with Mr. T. F. Rowland, M. Am. Soc. C. E., a set of regulations had been prepared, which were presented and adopted. These are published upon another page of these proceedings. A statement was then presented as to the arrears due from members; and five members, to whom proper notification had been addressed more than six months previous to this date, and now still in arrears, were dropped from the roll of the Society. In the case of all other members whose dues are unpaid previous to those for the current year, the notification prescribed in the constitution was ordered sent. Appropriations were made.

APRIL 4TH, 1883.—Applications were considered. The Secretary announced the preliminary arrangements for the Convention, as made by correspondence. These were approved, and the Secretary authorized to perfect the arrangements.

APRIL 11TH, 1883.—Ordinary routine business transacted.

APRIL 13TH, 1883.—Arrangements for the Convention reported by the Secretary were considered.

APRIL 18TH, 1883.—Additional arrangements for the Convention were made. Financial business was transacted, and appropriations made.

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### CONTRIBUTIONS TO THE BUILDING FUND.

By a resolution of the Board of Direction, all contributions to the Building Fund are to be acknowledged, from time to time, by printing lists of the same in the monthly Proceedings of the Society, and in addition to this the names of all those who may subscribe \$100 or more are to be regularly enrolled and published in future lists of the Society under the head of Subscribers to the Building Fund, and they will be entitled to receive one copy of the monthly publications, comprising all papers and Transactions of the Society, regularly, for life, for each \$100 subscribed by them; such copies to be in addition to those which they may be already entitled to if they are Members or Fellows.

The following contribution is acknowledged in addition to those heretofore noted :

Arthur Brown.....	\$100 00
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### THE ROWLAND PRIZE.

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#### CODE OF RULES FOR ITS AWARD.

Not more than one prize shall be awarded each year for papers presented during the year. The medal year shall terminate on the first day of August, and the award shall be announced at the annual meeting in January.

The prize shall consist of fifty dollars in cash.

The award shall be made by a committee consisting of the Secretary and two members of the Society, to be appointed by the Board of Direction.

The prize shall be awarded to such paper as the committee deem most worthy of such recognition, the preference being given to papers describing in detail accomplished works of construction, their cost and manner of execution, and the errors in design and execution.

## THE NORMAN MEDAL.

### CODE OF RULES FOR ITS AWARD.

I.—Competition for the Norman Medal of the American Society of Civil Engineers shall be restricted to members of the Society.

II.—There shall be one gold medal, and only one, struck for each and every fiscal year of the Society, and awarded as hereinafter provided. The dies therefor shall be with the Superintendent of the United States Mint at Philadelphia, in trust exclusively for the above purpose. Such medal shall be of a cost equal to the annual interest received upon \$1 000 of the Consolidated Stock of the City of New York, Certificate No. 179, of the additional new Croton Aqueduct Stock of the City of New York, authorized by an Act of the Legislature of the State of New York, Chap. 230, passed April 15th, 1870, dated November 17th, 1873, now held in trust by the Treasurer of this Society, and so held solely for this purpose, and shall be executed upon his order.

III.—All original papers presented to the Society by members of any class, during the year for which the medal is awarded, shall be open to the award, provided that such papers shall not have been previously contributed in whole or in part to any other association, nor have appeared in print prior to their publication by the Society, nor have been presented to the Society in any previous year.

IV.—The Board of Censors to award the medal shall consist of three members of the Society, to be designated by the Board of Direction. The Secretary of the Society shall act as Secretary to the Board of Censors.

V.—The medal shall be awarded to such paper as the said Board shall judge to be worthy of special commendation for its merits as a contribution to engineering science, not merely relatively as compared with others presented during the same year, but as exhibiting the science, talent or industry displayed in the consideration of the subject treated of, and for the good which may be expected to result from the discussion and the inquiry.

VI.—In case no paper presented during the year shall be deemed of sufficient value to receive an award, the amount of the interest of the fund for that year shall be expended by the Board of Direction in the purchase of books, to be offered as a premium for the second best paper in the next year in which more than one paper of sufficient value may be presented.

VII.—The medal year shall terminate on the first day of August, and the award shall be announced at the annual meeting.

VIII.—The Treasurer of this Society shall cause the medal to be prepared and delivered to, or deposited to the order of, the successful competitor, within two months after the annual meeting at which the same shall have been awarded.

## CONTRIBUTIONS TO THE BUILDING FUND.

By a resolution of the Board of Direction, all contributions to the Building Fund are to be acknowledged, from time to time, by printing lists of the same in the monthly Proceedings of the Society, and in addition to this the names of all those who may subscribe \$100 or more are to be regularly enrolled and published in future lists of the Society under the head of Subscribers to the Building Fund, and they will be entitled to receive one copy of the monthly publications, comprising all papers and Transactions of the Society, regularly, for life, for each \$100 subscribed by them ; such copies to be in addition to those which they may be already entitled to if they are Members or Fellows.

The following contribution is acknowledged in addition to those heretofore noted :

R. E. Briggs.....	\$100 00
A. F. Wrotnowski.....	30 00

## LIST OF MEMBERS.

## ADDITIONS.

## MEMBERS.

Date of Election.

APPLETON, THOMAS.....	Ass't Engineer Topeka, Salina and Western R. R., Kansas.....	April 4, 1883.
CORNELL, OLIVER H. P.....	Div. Engineer New York, West Shore and Buffalo Ry., Albany, N. Y.....	April 4, 1883.
KENDRICK, JOHN W.....	Engineer Construction, Minn. and Sauk Rapids Div. N. P. R. R., Minneapolis, Minn.....	June 6, 1883.
ROGERS, ALBERT B .....	(Care D. J. Whittemore, Esq.), Milwaukee, Wis.....	June 6, 1883.
TULLOCK, ALONZO J.....	Supt. Missouri Valley Bridge and Iron Works, Leavenworth, Kan.....	June 6, 1883.

## JUNIORS.

CONNETT, ALBERT N.....	South Orange, N. J.....	June 6, 1883.
YATES, PRESTON K.....	Canajoharie, N. Y.....	June 6, 1883.

## FELLOW.

WELLS, DAVID L.....	Milwaukee, Wis.....	June 13, 1883.
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George Washington Polk, San Antonio, Texas; Watson Wellman Rich, St. Paul, Minn.; Leonard W. Rundlett, St. Paul, Minn.; Edward Higginson Williams, Philadelphia, Pa. As Associates—Joseph P. Card, St. Louis, Mo.; George Fillmore Swain, Boston, Mass. As Juniors—George B. Francis, Portland, Oregon; Alfred Williams Trotter, New York City; Frederick Newton Willson, Princeton, N. J.; and Herbert M. Wilson, New York City.

The election as Fellows of the Society of the following persons was announced: John Lawler, Prairie du Chien, Wis.; D. L. Wells, Milwaukee, Wis.; Alexander Mitchell, Milwaukee, Wis.; C. L. Colby, Milwaukee, Wis.; Albert Conro, Milwaukee, Wis.; Edward P. Allis, Milwaukee, Wis.; Francisco De Garay, City of Mexico.

The deaths of the following Members of the Society were announced: Col. Francis U. Farquhar, Corps of Engineers, U. S. A., elected Member July 15th, 1872, died July 3d, 1883; Redmond J. Brough, Toronto, Canada, elected Member Sept. 1st, 1880, died July 21st, 1883.

A paper by James L. Randolph, M. Am. Soc. C. E., "On Vibration, or the Effect of Passing Trains on Iron Bridges, Masonry and other Structures," was read and discussed by Messrs. Blunden, Cooper, Emery and W. H. Paine.

SEPTEMBER 19TH, 1883.—The Society met at 8 P. M., Vice-President Paine in the chair; John Bogart, Secretary.

The death of Mr. John C. Trautwine, C. E., was announced, with remarks.

A discussion "On the Increased Efficiency of Railways for the Transportation of Freight," by Charles Douglas Fox, Cor. M. Am. Soc. C. E., was read and discussed by Messrs. Bogart, Cooper and W. H. Paine.

A paper on "Bridge Floors," by W. Howard White, M. Am. Soc. C. E., was read and discussed by Messrs. Blunden, Bogart, Cooper, Knap and W. H. Paine.

## OF THE BOARD OF DIRECTION.

AUGUST 8TH, 1883.—Applications were considered. Action was taken as to arrears of dues. Appropriations were made.

SEPTEMBER 5TH, 1883.—Applications were considered. Action was taken as to the Library.

OCTOBER 3D, 1883.—Applications were considered. Action was taken as to arrears of dues. A communication was received from the American Society of Mechanical Engineers, and that Society was invited to hold its approaching annual meeting at the house of the American Society of Civil Engineers.

## MEMOIRS OF DECEASED MEMBERS.

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ASHBEL WELCH, President Am. Soc. C. E.

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DIED SEPTEMBER 25TH, 1882.

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Ashbel Welch was born at Nelson, Madison County, New York, December 4th, 1809. His parents were Ashbel and Margaret Welch. At the age of seven his family moved to Deerfield, Oneida County, New York, and he attended different schools in the City of Utica from that time until the year 1826. In 1821 Mr. Welch's elder brother, Sylvester, began his career as a civil engineer upon the works of the Erie Canal, at Amsterdam, New York. In the winter of 1826 Ashbel attended the Albany Academy, and was under the immediate instruction of Professor Joseph Henry, with whom, when the distinguished Director of the Smithsonian Institute, Mr. Welch was afterwards professionally engaged. Late in the summer of 1827 Mr. Welch left Albany to begin his engineering life upon the Lehigh Canal. He first set foot in New Jersey, the State with whose development he was thereafter so intimately connected, on July 31st, 1827, at Elizabethtown Point, and traveling across the State he was detained at Morristown two days, waiting the arrival of a stage. He thence went to Easton and joined his brother Sylvester at Mauch Chunk. Sylvester was then Resident Engineer of the Lehigh Canal, and Ashbel's first service as an engineer was in August, 1827. He notes in his diary that he that month first met William Milnor Roberts, his predecessor as President of the American Society of Civil Engineers, and the late Solomon W. Roberts, so long the Chief Engineer of the Northern Pennsylvania Railroad.

Mr. Welch began as a rodman, and his pay was \$13 per month and found. In May, 1829, he became leveler, and Mr. Edward Miller, whose name is so well known among engineers, was then his rodman. Mr. Welch continued upon the Lehigh and Pennsylvania Canal and upon railroad work until September, 1830, when he went to Trenton, New Jersey, upon the works of the Delaware and Raritan Canal. He first

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NOTE.—This memoir has been prepared by John Bogart, M. Am. Soc. C. E., Editor of the Transactions of the Society, who desires to express his obligations to Mr. John G. Stevens and Mr. Francis B. Stevens for valuable information; also to the family of Mr. Welch, who have placed at his disposal many interesting papers relating to the life and works of Mr. Welch.



visited Lambertville, New Jersey, May 17th, 1831, and took up his final residence there in May, 1832, where his home has been ever since. He was, in 1832, in charge of the upper division of the feeder of the canal. In 1834 Mr. Welch married Miss Mary Hannah Seabrook.

In 1835 Mr. Welch was made the Chief Engineer of the Delaware and Raritan Canal, and during 1836 he made reconnoissances and estimates for the construction of the Belvidere Delaware Railroad, and on August 15th of that year he was appointed Engineer of the Philadelphia and Trenton Railroad. Mr. Welch, while continuing his services as Engineer of the railroad and canal works in New Jersey, was also engaged during 1838, 1839 and 1840 upon various other works as Consulting Engineer, in connection with Commodore Stockton, Mr. E. A. Stevens, Captain John Ericsson, Mr. Horatio Allen and others.

He assisted Captain Ericsson upon the plans for the steamer Princeton. He visited Virginia in reference to the development of coal and iron lands. He superintended the experiments in gunnery instituted by Commodore Stockton, and was constantly and very actively engaged up to December, 1844, when he made a visit to Europe, the special object of which was to supervise the construction of a large wrought-iron gun intended for the United States Navy. He was absent six months, and traveled in England, Scotland, Ireland, France and Belgium. Mr. Welch returned to America in June, 1845. In the fall of that year he was engaged with Professor Henry in investigations as to methods of telegraphy. In 1847 he built a wooden lock at the outlet of the Delaware and Raritan Canal, at Bordentown. In consequence of the failure of the foundation of the old lock, which was built on a very fluid quicksand, a settlement of the walls occurred of so serious a character as to make the construction of a new lock necessary. After very careful consideration, Mr. Welch determined to take an entirely new departure in regard to the foundation, and discarding piling, cribbing, béton, &c., to build the lock directly upon the quicksand itself. He reasoned that from the incompressible character of that material it would form the best of foundations provided it could be absolutely retained in place; he was aware, however, that a great source of danger would exist unless every avenue was stopped by which any undermining might occur from the water, the pressure of which would be great both at the inlet and outlet. From the light nature of the quicksand, a leak no larger than a pipe-stem would in time undermine the whole structure.

The plan was bold and original in conception, and required the most careful and cautious treatment as to the details and methods to meet the difficulties.

The lock was built of timber; it was constructed on the land; the sides were divided in cells; the bottom was of exceptionally heavy timber, all the work being carefully jointed and then thoroughly caulked; the structure was then launched and sunk in the pit which had

been dredged for its reception ; the cells were then filled with selected gravel and carefully puddled. The inlet and outlet were protected by lines of heavy steel piling, which were guarded by ingenious devices so as to be perfectly water-tight. The lock has now been in use for thirty-five years, and not the slightest settlement has occurred, evidencing the skill employed both in the planning and construction.

This combination of boldness of conception and excessive caution in details is illustrative of Mr. Welch's methods.

In 1848 he was in charge of the work of final location of the Belvidere Delaware Railroad, and built that road, which was opened from Trenton to Lambertville early in 1851. The whole road was constructed to Manunka Chunk under Mr. Welch's direct supervision, including the coal wharves at Trenton.

On December 20th, 1852, the stockholders of the Delaware and Raritan Canal very suddenly determined to enlarge its capacity, and that work was put in charge of Mr. Welch, and was successfully accomplished April 4th, 1853, for less money than the original estimate.

Among other matters the enlargement included the construction of a new lock with walls of 260 feet in length, the lengthening of twelve others 130 feet, two of these being tide-locks requiring the use of heavy coffer-dams. The order from the Board of Directors was given December 20th, with instructions to have the work completed the last of March, which was accomplished. No place had been prepared ; not a yard of stone, not a foot of lumber, not a pound of material of any kind procured ; furthermore, there was an absence of trained and skilled labor, nor was there any organization for the execution of the work, which had to be done in the depth of winter, at widely separated and inaccessible points, where no facilities existed for sheltering the men. 25 000 cubic yards of masonry had to be laid, and protected from the frost during construction.

The necessary preliminary arrangements occupied a large part of the short time allowed, leaving not more than fifty working days for the work itself. Its completion within the time allowed was an evidence of Mr. Welch's remarkable administrative ability.

In the latter part of 1853 Mr. Welch prepared the plans, made all the contracts and supervised the execution of the works on the Chesapeake and Delaware Canal, including the construction of the new locks. He introduced steam pumps and a water-saving basin, which has proved a great success.

The arduous labors and heavy responsibilities of these works, particularly the construction of the Belvidere Railroad and the enlargement of the Delaware and Raritan Canal, seriously undermined the health of Mr. Welch, which, for a number of years thereafter, was very delicate. In 1854, at the suggestion of the joint Board of Direction of that canal and of the Camden and Amboy Railroad, he again visited Europe, re-

turning in September of the same year. He then supervised the completion of the Chesapeake and Delaware Canal, which was opened in May, 1855. During the subsequent years he was actively employed upon railroads and other engineering work, building the railroad wharves at Amboy, and in 1861 was engaged in experiments with Mr. E. A. Stevens in reference to the well-known floating battery. In October, 1862, he was appointed Vice-President of the Camden and Amboy Railroad, and thenceforward became its executive officer, being active in arranging the consolidation of the New Jersey railroad companies. In March, 1867, the final arrangements were made, uniting the Delaware and Raritan Canal Company, the Camden and Amboy Railroad and Transportation Company, and the New Jersey Railroad and Transportation Company, so that thereafter their interests were associated, as though they were consolidated into one company. Mr. Welch was elected the general president of the associated companies, and was constantly in the actual charge of the administration of their affairs, up to December, 1871, when the properties of these united companies were leased by the Pennsylvania Railroad. Mr. Welch thus became the president and manager of one of the most important lines in the United States. The companies owned a canal and two lines of railway which connected the cities of New York and Philadelphia, forming, as expressed by Mr. Welch, one single, though complex system.

The consolidation of the interests of these companies added very largely to the aggregate value of their property, and secured to the public much greater accommodation than had been previously practicable.

The connection made by the construction of the connecting road at Philadelphia, and the arrangements whereby the passengers and freight coming over the Pennsylvania road were brought by these lines to the harbor of New York, threw upon the manager very great responsibilities, which were met with business ability and cautious energy. The Board of Joint Directors comprised men of great experience and ability in the management of great corporations, Mr. Welch being the General President, the Hon. Hamilton Fish Vice-President, with Mr. Joseph P. Bradley as General Secretary. Among the officers and directors were well-known names, such as R. F. Stockton, William H. Gatzmer, John G. Stevens, Richard Stockton, Benjamin Fish, Moses Taylor, Benjamin G. Clarke, Dudley S. Gregory, Alfred L. Dennis and others.

Mr. Welch had the absolute confidence of these gentlemen. The time was one of great improvements in railway construction, repair, train running and general management, and to Mr. Welch is due the careful consideration and the gradual introduction of some of the greatest advances which have been made in that direction in the world.

In 1869 Mr. Welch again visited Europe, traveling on the Continent and in England for six months. During this trip he investigated carefully the Belgium system of cable towing. In January, 1871, negotia-

tions were commenced for the lease to the Pennsylvania Railroad Company of the properties controlled by the United Railroad and Canal Companies of New Jersey, which lease was consummated during that year, when Mr. Welch retired from the active management of the road. Since that date he has been constantly engaged as consulting engineer upon many important works, and notably during the two years previous to his decease he has been acting in that capacity for the New York, West Shore and Buffalo Railroad.

Mr. Welch was appointed by the Governor of New Jersey, June 29th, 1882, a commissioner to determine upon plans for the storage of the waters of the State for the purpose of furnishing the cities and towns a joint water supply, under an act directing the appointment of such a commission, and he was engaged at the time of his decease in the duties connected with this appointment.

In the active practice of his profession, as connected with the responsible positions which Mr. Welch held almost continuously through his long life, there were, of course, very many special engineering investigations which he undertook and carried to completion. It is impossible in a brief memoir even to refer to the larger number of these. Some, however, may be noted, in which he took the greatest interest.

In the development of improvements for transportation of freight through canals, Mr. Welch succeeded in adding largely to the carrying capacity of the canals under his charge. Perhaps the most effective change made by him in this respect was the introduction of steam power to operate the locks and haul the vessels in and out of the locks. In 1868, the Delaware and Raritan Canal having reached the limit of its locking capacity, he devised a method of applying steam power at these locks, and at once increased their capacity, and therefore that of the canal, at least 50 per cent. This method is still in operation, and its success is complete. The apparatus is safe and strong, and has been kept in order with very small expense since its introduction.

Mr. Welch was deeply interested in all the questions connected with canal navigation, and his consideration of the various points involved in the proposed Inter-oceanic Canals added largely to the interest of the recent discussions on that subject.

In March, 1865, Mr. Welch drew up, and presented to his railroad company, a scheme for telegraphic safety signals to be adopted between Kensington and New Brunswick, which were, on March 27th, formally adopted by the company. This scheme secured the introduction of a system by which a train passing one of the signal stations should be informed whether the preceding train going in the same direction had passed the next signal station, and whether the track was clear. The stations were to be located not more than six miles apart, and at points where, as far as practicable, there should be a good view each way. The signals were arranged so that the signal-man should have a simple

method of marking the fact that a train was on the section, or that any obstruction had been reported on that section, and the regulation was that the safety signal should not be exhibited to an approaching train unless information had been received that all trains in the section in advance had passed the next signal station, and that all reported obstruction had been removed. The engine men were ordered absolutely to stop unless the safety signal should be exhibited.

This system, adopted in the year 1865, it will be seen, was an application, and it is claimed to have been an original application, of the system of safety signals—that is to say, of the theory that a train should not go upon any section of the railroad until it should be notified that, as far as telegraphic communications for the section in advance could be relied upon, that section was entirely free.

At the time he put this system in operation Mr. Welch had not heard of the English block system, which, however, as used at that time, was radically different, the line being considered open unless a block warning was given. The main point insisted upon by Mr. Welch was to secure affirmative evidence that the track was clear—in other words, to use safety signals, not danger signals.

The tendency at the present time is towards the substantial adoption of the principle thus initiated by Mr. Welch twenty years ago, and this fact is merely one of the many proofs of the far-sighted sagacity shown by him in the consideration of the subjects to which he devoted his thought.

Mr. Welch gave a great deal of attention to the construction of railway car trucks, and in 1869 invented an improved truck combining several modifications of the ordinary methods of construction. The question of the proper form, dimensions and weights of rails perhaps occupied as much of the attention of Mr. Welch as almost any other subject. In the year 1865 he devised and selected the forms of rails to be used for the New Jersey railways, and these were determined upon principles very nearly identical with those set forth in the report of the committee on the form, weight, manufacture and life of rails, which was presented to the American Society of Civil Engineers in 1874, to which report was appended a memoir on the subject written by Mr. Welch.

In 1866 Mr. Welch secured, after much negotiation and several unsuccessful efforts, the manufacture of steel rails of a pattern substantially similar to those which are now considered standard. These rails were rolled at Sheffield in 1866, and were laid down upon the New Jersey railways in the spring of 1867. Large additions of the same pattern were laid down in 1868, and all these rails show remarkable results.

Mr. Welch wrote to considerable extent upon this subject of rails, and his papers have been published in the Transactions of the American Society of Civil Engineers, in the Transactions of the American Institute of Mining Engineers, and in various periodicals. He developed

a formula and tables showing his theory of the comparative economy of iron and steel rails. His careful labor upon this question of the form, weight and economy of rail construction has contributed greatly to the successful development of American railway transportation.

Mr. Welch also studied the questions connected with the manufacture of car wheels, and embodied his conclusions on this subject in a number of interesting papers and reports.

Mr. Welch made very extensive investigations, at the request of Mr. E. A. Stevens, with reference to the construction and alteration of the great Stevens battery. These investigations went into many pertinent subjects, and particularly in regard to the effect of shot under water, the velocity of projectiles, etc.

As General President of the Associated New Jersey Companies, Mr. Welch appreciated the great future advantage of large wharf and terminal facilities at the City of New York, and the result of his long-continued and very arduous labor was the purchase of the Harsimus Cove property, which was effected by the companies under his advice.

This property was developed under his direction by the construction of wharves and other improvements, and now affords to that system of railroads an excellent terminus, which is absolutely necessary to the transaction of its enormous business. The purchase of this property was accomplished not without opposition, and was persistently advocated and completed by Mr. Welch, in consequence of his assurance that it was of the greatest importance to the interests of the railway system of which he had charge.

The character of Mr. Welch was of a singularly elevated tone. Great purity and entire disinterestedness lay at its foundation. No consideration could ever make him swerve a hair's breadth from an honorable, straightforward course. These facts, combined with the possession of broad and generous views, were among the causes of the great moral influence that he exercised. While not demonstrative in manner, he had a warm, genial, sympathetic nature, and where best known he was best loved. His temper was most equable, and while thoroughly self-poised himself, he was always disposed to make the largest allowance for the faults of temper of others. This marked peculiarity was one of the products of his great unselfishness.

A sketch of Mr. Welch's life would be entirely incomplete and unfair if reference were not made to his deeply religious character. He was not only a consistent Christian, but he never permitted the remarkably extensive duties of an active professional life to interfere with the discharge of quite as active work connected with religion and charity. He became a member of the Presbyterian Church in the year 1832, and was connected with that organization continuously to his death, being for many years an elder of the church. He took an active part in this work, and exemplified thoroughly how a man could possess the business

qualifications which brought to him the confidence of some of the best business men in the United States in the management of very great interests, and at the same time could continue to be a simple-minded, earnest, Christian gentleman.

Mr. Welch became a member of the American Society of Civil Engineers August 7th, 1872. He was made Vice-President November 3d, 1880, and President of the Society January, 1882, his death occurring while holding its highest office. His interest in the work of the Society was very great, and his duties as its President were performed with the same thoroughness and attention which he gave to all the trusts which were confided to him.

## LIST OF MEMBERS.

## ADDITIONS.

## MEMBERS.

Date of Election.

BELL, ANDREW . . . . .	Res. Engineer, Carillon Canal Works, Carillon, Canada . . . . .	Sept. 5, 1883.
BLISS, HENRY I. . . . .	La Crosse, Wis. . . . .	" " "
CAMPBELL, CHARLES H. . . . .	(Raymond & Campbell), Council Bluffs, Ia. . . . .	Oct. 3, 1883.
CARD, WILLIAM W . . . . .	Sec'y Westinghouse Air Brake Co., Pittsburgh, Pa. . . . .	Sept. 5, 1883.
DORAN, FRANK C. . . . .	City Engineer, Richmond, Ind. . . . .	" " "
DOWNE, GEORGE . . . . .	Supt. Motive Power, New South Wales Gov't Steam Tramways, Randwick, Sydney, New South Wales, Australia. . . . .	" " "
JENNINGS, WILLIAM H. . . . .	Eng'r Hocking Valley Div. Columbus, Hocking Valley and Toledo Railway, Columbus, Ohio. . . . .	" " "
MAN, ALBON P., JR. . . . .	1st Asst. Engineer, St. Louis and San Francisco Railway, St. Louis, Mo. . . . .	" " "
MARR, GEORGE A. . . . .	U. S. Asst. Engineer, St. Paul, Minn. . . . .	Oct. 3, 1883.
MCCOOL, DANIEL. . . . .	Chief Engineer, Detroit, Mackinaw and Marquette Railroad, Marquette, Mich. . . . .	Sept. 5, 1883.
MCGRATH, WALLACE. . . . .	Chief Engineer, Ohio Valley Construc- tion Company, Parkersburgh, W. Va. . . . .	" " "
O'HANLY, JOHN L. P. . . . .	Chief Engineer, Ontario Pacific R'wy, Ottawa, Canada . . . . .	" " "
POLK, GEORGE W. . . . .	Chief Asst. Eng. International Construc- tion Company, San Antonio, Texas. . . . .	" " "
RICH, WATSON W. . . . .	Chief Engineer, Minnesota Central Rail- road, St. Paul, Minn. . . . .	" " "
ROSEWATER, ANDREW. . . . .	City Engineer, Omaha, Neb. . . . .	Oct. 3, 1883.
RUNDLETT, LEONARD W. . . . .	Engineer, Water Commission, St. Paul, Minn. . . . .	Sept. 5, 1883.
TOWNE, HENRY R. . . . .	President and Engineer, Yale and Towne Mfg. Co., Stamford, Conn. . . . .	Oct. 3, 1883.
WATKINS, FREDERICK W. . . . .	113 East One Hundred and Fifteenth St., New York City. . . . .	" " "
WILLIAMS, EDWARD H. . . . .	Baldwin Locomotive Works, Phila- delphia, Pa. . . . .	Sept. 5, 1883.

## ASSOCIATES.

CARD, JOSEPH P. . . . .	President St. Louis Wood Preserving Company, St. Louis, Mo. . . . .	Sept. 5, 1883.
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	Date of Election.
SWAIN, GEORGE F.....	Professor of Civil Engineering, Massachusetts Institute of Technology, Boston, Mass.....
	Sept. 5, 1883.

## JUNIORS.

FRANCIS, GEORGE B.....	39 Summit Ave., Jersey City, N. J.....	Sept. 5, 1883.
FULLER, FRANK L.....	7 Exchange Place, Boston, Mass.....	April 4, 1883.
TROTTER, ALFRED W.....	Res. Engineer, Northern Adirondack Railroad, St. Regis Falls, Franklin Co., N. Y.....	Sept. 5, 1883.
WILLSON, FREDERICK N....	Professor of Engineering and Mechan- ical Drawing, College of New Jersey, Princeton, N. J.....	" " "

## FELLOWS.

ALLIS, EDWARD P.....	Milwaukee, Wis.....	Aug. 14, 1883.
COLBY, CHARLES L.....	President Wisconsin Central Railroad, Milwaukee, Wis.....	" 22, "
CONBO, ALBERT.....	Milwaukee, Wis.....	" 18, "
MITCHELL, ALEXANDER....	President Chicago, Milwaukee and St. Paul Railway, Milwaukee, Wis.....	July 27, 1883.

## CHANGES AND CORRECTIONS.

## CORRESPONDING MEMBER.

GLEIM, CHARLES O....	(Care Baudeputation), Hamburg, Germany.
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## MEMBERS.

APPLETON, THOMAS.....	Leavenworth, Kansas.
ATWOOD, WILLIAM H.....	Div. Eng'r, South Penn. R. R., Fannettsburg, Pa.
BARNARD, A. P.....	Kingsville, Mo.
BILLIN, CHARLES E.....	261 South Fourth St., Philadelphia, Pa.
BIXBY, WILLIAM H.....	Captain of Engineers U. S. A., 33 West Houston St., New York City.
CALKINS, FRANK A.....	Arsenal, Central Park, New York City.
CAMPBELL, ALLAN.....	125 Lexington Ave., New York City.
CARTWRIGHT, ROBERT.....	Gen. Supt. Yale and Towne Manufg. Co., Stamford, Conn.
CHITTENDEN, S. H.....	Corcoran Building, Washington, D. C.
DOANE, WALTER A.....	Div. Eng. C. P. R. R., Medicine Hat, North-Western Territory, Canada.
FOGG, CHARLES E.....	Poughkeepsie, N. Y.
FRIZELL, JOSEPH P.....	7 Exchange Place, Boston, Mass.
FULLER, SIDNEY T.....	12 James Street, Franklin Square, Boston, Mass.

- GATES, HORACE D. .... Bernice, Churchill Co., Nevada, *via* Lovelock's Station, C. P. R. R.
- GIELOW, HENRY J. .... Sawyerville, Hale Co., Ala.
- GOLAY, PHILIP. .... Paducah, Ky.
- HARRIS, WILLIAM P. .... White Sulphur Springs, W. Va.
- HOOD, WILLIAM. .... Chief Engineer C. P. R. R., San Francisco, Cal.
- JORDAN, GABRIEL. .... Vice-Pres. and Gen. Man. M. and O. R. R., Mobile, Ala.
- KENDRICK, JOHN W. .... Chief Eng. St. P. & N. P. R. R., Minneapolis, Minn.
- KENNEDY, WILLIAM H. .... Div. Eng. O. R. & N. Co., Walla Walla, Wash. Ter.
- KINNEY, EDWARD C. .... Lorraine, Ohio.
- KNAPP, LOUIS H. .... 280 Linwood Avenue, Buffalo, N. Y.
- MASTEN, C. S. .... Div. Eng. W. St. L. and P. Rwy., Moberly, Mo.
- McMATH, R. E. .... City Hall, Room 10, St. Louis, Mo.
- MONROE, J. ALBERT. .... Providence, R. I.
- OPDYKE, STACY B. .... Supt. N. H. & N. Co., New Haven, Conn.
- PARTRIDGE, JOHN A. .... Empire House, Buffalo, N. Y.
- POE, ORLANDO M. .... Major Corps of Engineers, Bvt. Brig.-Gen. U. S. A., 34 Congress Street, West, Detroit, Mich.
- RAY, N. C. .... Ass't Eng. U. P. R. R., Railroad Building, Omaha, Neb.
- RIVES, A. L. .... Vice-Prest. R. & D. R. R., Richmond, Va.
- SAVAGE, ALBERT C. .... Supt. Cons. Mex. International R. R., San Antonio, Texas.
- SEARLES, WILLIAM H. .... Elyria, Ohio.
- SMITH, CHARLES A. .... Newburyport, Mass.
- SMITH, HAMILTON, Jr. .... (Care of Laidlaw & Co.), 14 Wall Street, New York City.
- SMITH, ISAAC W. .... Chief Eng. O. P. R. R., New Tacoma, Wash. Ter.
- VAN BROCKLIN, MARTIN. .... Oneida, N. Y.
- VANCE, HART. .... Wilson's Point, La.
- WALLING, HENRY F. .... Topographer U. S. Geological Survey, Pittsfield, Mass.
- WILLIAMSON, WM. G. .... (Care Gen. Man. Western Rwy. of Ala.) Montgomery, Ala.
- WROTNOWSKI, ARTHUR F. .... (Care W. H. Sharp), 28 South Sixth Street, Philadelphia, Pa.
- YONGE, SAMUEL H. .... Chief Eng. L. & K. C. Div. Improvement Missouri River, 213 Missouri Ave., Kansas City, Mo.
- YORKE, EDWARD. .... 1526 Tenth Street, Sacramento, Cal.

## JUNIORS.

- BROOKS, FREDERICK. .... 130 Boylston Street, Boston, Mass.
- CORNELL, GEORGE B. .... Ass't Eng., Bridge Dept., N. Y. W. S. & B. R. R., Mills Building, New York City.
- CROSBY, B. L. .... Rulo, Richardson Co., Neb.
- CURTIS, WENDELL R. .... U. S. Ass't Eng., P. O. Box 133, Savannah, Ga.
- EMONTS, W. A. G. .... 413 Walnut Street, Philadelphia, Pa.

HAVILAND, ARTHUR.....(Care of E. Wanzer), Plainfield, N. J.  
HORTON, SANDFORD.....27 Reynolds Arcade, Rochester, N. Y.  
LEDERLE, GEORGE A. ....Snake River Bridge, Ainsworth, Wash. Ter.  
MACY, ARTHUR.....Silver King, Pinal Co., Arizona.  
REUSCHEL, WILLIAM.....Engineer C. C. C. & I. Ry., and I. & St. L. Ry., Cleve-  
land, Ohio.  
ROSENWEIG, ALFRED.....(Care Agn. Gutheil & Co.), San Luis Potosi, Mexico,  
via Laredo, Texas.  
WEBSTER, ALBERT L. ....Johns Hopkins University, Baltimore, Md.

## DEATHS.

ANSLEY, GEORGE D. . . . . Elected Member September 4th, 1878. Died September 22d, 1883.

BROUGH, REDMOND J. . . . . Elected Member September 1st, 1880. Died July 21st, 1883.

DRESSER, GEORGE W. . . . . Elected Member July 5th, 1876. Died May 27th, 1883.

# American Society of Civil Engineers.

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## PROCEEDINGS.

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Vol. IX.—October, 1883.

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### MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

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#### OF THE SOCIETY.

OCTOBER 3d, 1883.—The Society met at 8 p. m., Director George S. Greene in the chair; John Bogart, Secretary. Ballots for membership were canvassed and the following candidates declared elected:

As Members—Charles Edward Henry Campbell, Council Bluffs, Ia.; George Anson Marr, St. Paul, Minn.; Charles John Augustus Morris, St. Paul, Minn.; Andrew Rosewater, Omaha, Neb.; Frank S. Stevens, Albany, N. Y.; Henry Robinson Towne, Stamford, Conn.; Frederick William Watkins, New York City.

The Secretary announced the death, on September 22d, 1883, of Mr. George Doane Ansley, M. Am. Soc. C. E., elected as such September 4th, 1878.

Mr. Robert L. Harris, M. Am. Soc. C. E., made the following remarks:

Mr. Chairman and Fellow Members: It is with feelings of sadness that I come here this evening, having learned of the death of three former engineering associates, of one of whom I would speak. Although not a member of this Society, yet he was an eminent and able member of our profession, and as such worthy of honorable mention here.

Samuel S. Montague, Chief Engineer of the Central Pacific Railroad, of California, died the past week near Shasta, Cal., at the age of about 46 years.

It was my social and professional privilege to have been associated with Mr. Montague some eighteen years ago in the Sierra Nevadas in California and Nevada. He was a quiet, industrious, tireless man ; small in stature, large in capacity. At about the age of 26 he was suddenly called to take engineering charge of what proved to be one of the greatest works of modern times. At that time the whole country was resounding with the din of arms; young men as well as old were distinguishing themselves in every active way, and the earlier stages of the enterprise mentioned, and its active workers, were therefore scarcely noticed.

A bold and heavy piece of engineering was to be located, designed and constructed. It was difficult upon that, the distant Pacific coast, to have reference to precedents; while there were also more than the usual number of original problems to be solved, yet the great expenditure of money was carried on with uniformly successful results.

Bold location, involving sharply curved tunnels, heavy rock masonry and trestle-work, was common; some thirty or forty miles of very strong timber snow-shed tunnels were built along mountains, where in places the snow avalanches would cut a swath through the heavy timber of a quarter mile wide for a half mile down the mountain side. I remember no failure of these or other structures except by fire.

Mr. Montague would have been a famous man in any country except for his peculiarly modest and unassuming manner; although this, one of the greatest works of the country, went on perfectly, smoothly and rapidly, with Mr. Montague here, there and everywhere, yet he seemed thoroughly unobtrusive. Without at first the title of chief engineer, working with that of acting chief engineer, yet he conquered, fairly earned and obtained the former title before the construction was accomplished, and ever since has been the respected chief engineer of the Central Pacific Railroad.

As an instance to show the small degree in which he made himself prominent, while his endeavors were entirely enlisted in the work and his influence was everywhere felt, I will cite that when the golden spike from California and laurel tie from San Francisco were being conveyed to the site of the last rail at Promontory (there to meet the Nevada silver hammer), these to be noted articles were privately shown me separately upon the steamboat from San Francisco to Sacramento by acquaintances who presented them.

Upon the golden spike were inscribed the names and titles of the president, directors, secretary and treasurer of the railroad, but the name and title of the chief engineer were missing. I asked the then owner of the tie to let me see the inscription on the silver plate ; it was similar to that upon the spike; a similar oversight had occurred, and there was no mention of him who had been so largely instrumental in the success of the construction and whose approval had been necessary in its details.

A surprised look and few words were all that was necessary. "What could be done? We would not omit the name and title of this busy worker, our active head and our friend, for anything, and it is now too late for re-engraving!" The omissions were remedied, however, for the inscriptions, as handed to and telegraphed by the reporters at the celebration, contained the name and title of Samuel S. Montague, Chief Engineer, although these were engraved subsequently.

While a bold, yet he was not an aggressive man. Timidity was never shown, and his parties took this cue from their leader. During the explorations easterly toward the Rocky Mountains, his parties worked with little if any escort, while it was the complaint of some of the parties working from the east that their movements were sometimes hampered by their military friends.

We engineers appreciate and admire master-pieces of creative design, harmonious structure and grand usefulness among the works of men. "An honest man is the noblest work of God," and as such we part with our friend Samuel S. Montague, C. E., at the close of his useful and honorable career.

On motion of Mr. Robert L. Harris, the following was adopted :

*Resolved*, Recognizing Mr. Samuel S. Montague, Chief Engineer Central Pacific Railroad of California, as a leader in our profession, we join our esteem to that of his associates and express our regrets at so early a close to his useful and honorable life.

A paper by James Christie, M. Am. Soc. C. E., on the subject of "Experiments on the Strength of Wrought-Iron Struts," was read, in the absence of the author, by the Secretary, and discussed by Messrs. Cooper and Emery.

OCTOBER 17th, 1883.—The Society met at 8 p. m., Director William G. Hamilton in the chair ; John Bogart, Secretary.

A paper by Mr. Charles J. Appleby, M. Inst. C. E., of London, on "Cranes as Labor-Saving Machines," was read by the author and discussed by Messrs. Emery, Greene, Cartwright, Platt, Cooper, Hamilton, R. L. Harris, Forney and the author.

**THE ANNUAL MEETING.**

The Annual Meeting will be held at the House of the Society, New York, on Wednesday, January 16th, 1884, at 10 A. M.

The Annual Reports will be presented; officers of the Society will be elected; the time and place for the next Annual Convention will be considered; reports of committees will be received and discussed, and other business will be transacted.

Arrangements for Wednesday, January 16th, and for Thursday, January 17th, will be perfected by special committees.

# American Society of Civil Engineers.

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## PROCEEDINGS.

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Vol. IX.—November, 1883.

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## MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

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### OF THE SOCIETY.

NOVEMBER 7TH, 1883.—The Society met at 8 P. M., Vice-President William H. Paine in the chair; John Bogart, Secretary. Ballots for membership were canvassed, and the following candidates declared elected: As Members—Thomas Norton Bailey, of Charleston, S. C.; Henry Waller Brinkerhoff, of Brooklyn, N. Y.; Ebenezer Smith Wheeler, of Sault St. Marie, Mich.

The death, on October 2d, 1883, of Mr. Thomas J. Seely, M. Am. Soc. C. E., and the death, on October 4th, 1883, of Mr. Henry Farnam, F. Am. Soc. C. E., were announced.

A paper by Mr. Edwin Thacher, M. Am. Soc. C. E., "Description of a Combined Triangular and Suspension Bridge Truss, and Comparison of its Cost with that of the Warren, Pratt, Whipple and Howe Trusses," was read by the Secretary, in the absence of the writer, and was discussed by members present.

A collection of samples of Mexican woods was presented by Mr. James D. Schuyler, M. Am. Soc. C. E., and a description of each variety was given. Specimens of woods collected in southern Michigan, and presented by Mr. John M. Goodwin, M. Am. Soc. C. E., and also



specimens of woods collected in the United States of Colombia, and presented by Mr. F. J. Cisneros, M. Am. Soc. C. E., were exhibited.

NOVEMBER 21ST, 1883.—The Society met at 8 P. M., Director George S. Greene, Jr., in the chair; John Bogart, Secretary. A paper by Mr. E. H. Keating, M. Am. Soc. C. E., on the Shubenacadie Canal, was read by the Secretary, in the absence of the writer, and was discussed.

A description, by Mr. Charles C. Smith, M. Am. Soc. C. E., of a hydraulic canal, built in very cold weather, at Minneapolis, was read by the Secretary, and discussed.

The recent adoption of a system of standard time for railways was discussed. Mr. J. E. Hilgard, M. Am. Soc. C. E., described the measures in progress in reference to the adoption of a standard prime meridian. He also stated the results of the recent meeting at Rome, Italy, of the superintendents of the geodetic surveys of various nations.

#### OF THE BOARD OF DIRECTION.

OCTOBER 31ST, 1883.—Applications were considered. The following members of the Society were appointed a Board of Censors to award the Norman Medal: Messrs. William R. Hutton, P. A. Peterson and F. Collingwood.

The following members of the Society were appointed, with the Secretary, a Committee to award the Rowland Prize: Messrs. Lucius A. Smith and De Volson Wood.

The report of the Nominating Committee was presented, and the action prescribed by the by-laws was directed.

NOVEMBER 7TH, 1883.—Applications were considered. A letter from the Mayor of the City of Philadelphia, requesting the selection of the names of two engineers in reference to the pavements for the streets of large cities, in accordance with an ordinance of the Councils of that city, was considered. In accordance with a vote of the Society in a similar case (see Proceedings, Vol. VIII, p. 101, September, 1882), the Board selected the following names: Edward P. North, M. Am. Soc. C. E., and Robert Moore, M. Am. Soc. C. E.

In accordance with the provisions of Article XXVII of the Constitution, it was ordered that the membership should cease of six persons whose arrears of dues had not been paid after six months' notice had been given in the regular form.

# American Society of Civil Engineers.

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## PROCEEDINGS.

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Vol. IX.—December, 1883.

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### MINUTES OF MEETINGS.

(Abstract of such as may be of general interest to members.)

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#### OF THE SOCIETY.

DECEMBER 5TH, 1883.—The Society met at 8 P. M., Vice-President William H. Paine in the Chair; John Bogart, Secretary. Ballots for membership were canvassed, and the following candidates declared elected: As Members—William A. Drake, Albuquerque, N. M.; Howard Vernon Hinckley, Topeka, Kansas; William S. Lincoln, St. Louis, Mo.; Elbert Nexsen, Stillwater, Minn.; and Poulter Benjamin Roberts, Calcutta, Bengal, India.

The death, on November 29th, 1883, of Arthur Spielmann, M. Am. Soc. C. E., and the death, on December 3d, 1883, of Howard Schuyler, M. Am. Soc. C. E., were announced.

A paper by Louis J. Le Conte, M. Am. Soc. C. E., on "Dredging Operations at Oakland Harbor, Cal.," was read by the Secretary, in the absence of the writer, and discussed by Messrs. Cooper, Glaskin, George S. Greene, Jr., Prindle, J. H. Staats and Worthen.

DECEMBER 19TH, 1883.—No quorum of the Society was present. [Over 100 members were at this date at Niagara Falls to witness the testing of the new railway cantilever bridge.]

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#### OF THE BOARD OF DIRECTION.

DECEMBER 5TH, 1883.—Applications were considered. Arrangements were made for the Annual Meeting. The Secretary was requested to prepare the Annual Reports.

## LIST OF MEMBERS.

## ADDITIONS.

## MEMBERS.

	Date of Election.
BAILEY, THOMAS N.....1st Lieut. Corps of Engineers, U. S. A., (P. O. Box 75,) Charleston, S. C.....	Nov. 7, 1883.
BRINCKERHOFF, HENRY W..91 Munroe st., Brooklyn, N. Y.....	Nov. 7, 1883.
DRAKE, WILLIAM A.....Chief Eng. Atlantic & Pacific R. R., Albuquerque, N. M.....	Dec. 5, 1883.
GATES, CHRISTOPHER L....(Elected Junior, Dec. 4, 1878), Eng. Milwaukee Bridge & Iron Co., Mil- waukee, Wis.....	Sept. 5, 1883.
HINCKLEY, HOWARD V....Office Engineer, Atchison, Topeka & Santa Fé R. R., Topeka, Kan.....	Dec. 5, 1883.
KIMBALL, FRANCIS W....Ass't Ch. Eng. Chicago, Milwaukee & St. Paul Ry., Milwaukee, Wis.....	May 2, 1883.
LINCOLN, WILLIAM S....Ch. Eng. Wabash, St. Louis & Pacific Ry., St. Louis, Mo.....	Dec. 5, 1883.
MORRIS, CHARLES J. A....P. O. Box 2544, St. Paul, Minn.....	Oct. 3, 1883.
WHEELER, EBENEZER S....Sup't St. Mary's Falls Canal, Sault Ste. Marie, Mich.....	Nov. 7, 1883.

## JUNIOR.

WILSON, HERBERT M.....(Care of H. Wilson), 26 Vesey st., New York City.....	Sept. 5, 1883.
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## RESIGNATIONS.

## MEMBERS.

ANDERSON, THOMAS S.....	October 18, 1883.
BROOKS, THOMAS B.....	December 31, 1883.
GUDE, ALBERT V.....	December 31, 1883.
KNEASS, STRICKLAND.....	December 31, 1883.
MUNROE, HENRY S.....	December 31, 1883.
PALMER, FRANCIS I.....	December 31, 1883.
SYMONS, THOMAS W.....	December 31, 1883.

## ASSOCIATE.

WELCH, ASHBEL, JR.....	November 3, 1883.
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AMERICAN SOCIETY  
OF  
CIVIL ENGINEERS.

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Instituted November 5, 1852.

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CONSTITUTION, BY-LAWS AND  
LIST OF MEMBERS.

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MAY, 1882.

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HOUSE OF THE SOCIETY, 127 EAST TWENTY-THIRD STREET,  
NEW YORK.



# American Society of Civil Engineers.

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## CONSTITUTION.

MARCH, 1882.

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ARTICLE I.—This association shall be called the AMERICAN SOCIETY OF CIVIL ENGINEERS.

ARTICLE II.—Its objects shall be: The professional improvement of its members, the encouragement of social intercourse among men of practical science, the advancement of engineering in its several branches, and the establishment of a central point of reference and union for its members.

ARTICLE III.—Among the means to be employed for attaining these ends shall be periodical meetings for the reading of professional papers and the discussion of scientific subjects; the foundation of a library; the collection of maps, drawings and models; and the publication of such parts of the proceedings as may be deemed expedient.

ARTICLE IV.—Civil, Military, Geological, Mining and Mechanical Engineers, Architects, and other persons who by profession, are interested in the advancement of science, shall be eligible for admission in their appropriate class.

ARTICLE V.—The officers of the Society shall consist of a President, two Vice-Presidents, a Secretary, Treasurer, Librarian, and five Directors, who shall be elected by written ballot, by a majority of votes, at the Annual Meeting of the Society. The term of office shall begin at the close of the Annual Meeting, and continue for one year, or until other officers are elected. Any vacancy occasioned by resignation or otherwise, may be filled at the next monthly meeting after notice of said vacancy.

ARTICLE VI.—The President, Vice-Presidents, Secretary, Treasurer and Directors shall constitute a Board of Direction, and shall be the Trustees of this Society, under the Act of Legislature of April 12th, 1848, chapter 319, Laws of the State of New York.

ARTICLE VII.—The Board of Direction shall meet within one week after their election, and the first business in order shall be the appointment of a Standing Committee of three on Finance, and of a Standing Committee of three on Library.

ARTICLE VIII.—The President, and in his absence the Vice-Presidents in rotation, shall preside at all the meetings of the Society; and in case of their absence, a President *pro tempore* shall be appointed.

ARTICLE IX.—The Secretary shall keep an accurate record of all the transactions of the Society and the Board of Direction, and shall issue all notices.

ARTICLE X.—The Treasurer shall have charge of the funds of the Society, receive all assessments, and pay all bills and orders approved by the President, or the Chairman of the Finance or Library Committees. The duties of the Secretary and Treasurer may be united in the same person, if the Society think proper. Moneys belonging to the Society, paid to any of its officers, shall, with a statement showing for what the payment was made, be promptly transmitted to the Treasurer, who shall receipt therefor.

The Treasurer shall deposit the moneys and invest the funds of the Society, in its name, by and with the advice of the Board of Direction ; he shall sign all checks.

No indebtedness shall be incurred for the Society, except under such rules as prescribed by the Board of Direction.

No bill shall be paid for the Society until it has been certified by the person authorized to contract it, and audited by the Committee on Finance.

ARTICLE XI.—It shall be the duty of the Librarian to take charge of the library of the Society, and to see that all books are marked with the name of the Society, numbered, and recorded in a catalogue. In respect to the management of the library, he shall conform to such regulations as may be prescribed by the Society or by the Board of Direction.

ARTICLE XII.—The duties of the Board of Direction shall be : To have a general care of the affairs of the Society ; to apply the funds in the Treasury ; to recommend the amount of assessments and appropriations for specific purposes, and to make a report on the affairs of the Society, embracing the report of the Treasurer, at the Annual Meeting.

ARTICLE XIII.—The Finance Committee shall have supervision of the accounts of the Society, shall examine all bills and demands, audit the accounts of the Treasurer, and certify to his annual report.

ARTICLE XIV.—The Library Committee shall have supervision of the rooms, printing and library of the Society, and shall apply to the purchase of books or other articles of permanent value to the Society, such sums as may be appropriated.

ARTICLE XV.—At any regular meeting of the Society, seven Members shall constitute a quorum for the transaction of business. But the action of a less number at any monthly meeting, at which a quorum is not present, may be entered on the journal, provided such action does not affect the rights of the association, or any members thereof.

ARTICLE XVI.—The active members of the Society shall be divided into three classes, to be styled respectively, Members, Associates, and Juniors ; and each person, when duly elected and qualified, shall receive a certificate of membership, indicative of the peculiar class which he represents. Associates and Juniors shall possess all the rights and privileges of Members, excepting the right of voting.

ARTICLE XVII.—A Member shall be a Civil, Military, Mining or Mechanical Engineer, who has been in active practice as such for seven years, or has graduated

as Civil Engineer and been in practice for five years, and has had responsible charge of work as Chief, Resident, or Superintending Engineer for at least one year; not as a skillful workman merely, but as one qualified to design as well as to direct public work.

An Associate shall be a manager of a railroad, canal or other public work; a geologist, chemist or mathematician; a proprietor or manager of a mine or metallurgical works; an architect or a manufacturer; or one who, from his scientific acquirements or practical experience, has attained eminence in his special pursuit, qualifying him to cooperate with engineers in the advancement of professional knowledge; but shall not himself be practicing as an engineer.

A Junior shall be one who has had actual practice in some of the branches of civil, military, mining or mechanical engineering, for not less than two years; or if a graduate of a scientific or collegiate institution—for not less than one year.

A person to be eligible to any class of membership must not be less than twenty-one years of age.

ARTICLE XVIII.—Nominations and proposals for admission to the Society shall be endorsed by at least five Members, who certify that they personally know the nominee or candidate, and that he is worthy of acceptance. The proposal for Member, Associate or Junior shall contain a statement, over the candidate's signature, of his age, residence, the nature and term of his professional service, and that he will conform to the requirements of membership, if elected. Fellows shall not be required to present themselves as candidates; those making the nomination shall state the ground therefor, and certify that the nominee will accept if elected.

A proposal for transfer from one class to a higher shall be made by at least five Members, and shall state the age of the candidate, and the nature and term of his professional service since his admission to the Society. Such statement shall show a degree of qualification sufficient to render the proposed eligible to election in the class to which transfer is asked. Upon the approval of the Board of Direction, the candidate shall be balloted for, as provided in the election of members; and when the transfer is made, he shall be required to pay as an additional entrance fee the amount of the difference between the entrance fees of the two classes.

ARTICLE XIX.—In elections for membership of either class, members shall vote by letter, or by ballot in the usual way, and the result shall be announced at the next regular meeting held after twenty-five days have elapsed from the time of mailing the notification. Five or more ballots cast in the negative shall exclude. Members notified but not responding, shall be classed as having voted in the affirmative. In case of the non-election of any person balloted for, no notice shall be taken thereof in the minutes.

ARTICLE XX.—On being thus elected, the candidate must subscribe to the Constitution and By-Laws (in the terms set forth in Form A in the Appendix), and pay to the Treasurer of the Society such sum as may be determined upon, under the authority of Article XXII. of the Constitution, as the regular entrance fee and yearly assessment, before he can be entitled to receive his certificate of membership. If this be not done within six months from the notification of the election, said election shall be considered void.



**ARTICLE XXI.**—Persons thus elected and duly qualified, who reside within fifty miles of the post-office in the City of New York, shall be deemed Resident ; and those who reside beyond this limit shall be deemed Non-Resident. The membership of any person shall begin on the day of his election.

**ARTICLE XXII.**—The amount of entrance fee to be paid, as well as the annual dues or assessments for the support of the Society, shall be determined from time to time, at some regular meeting of the Society, provided that notice of intended action thereon shall have been given at a previous regular meeting. No alteration in the amount of said fees or assessments shall apply to the fiscal year during which it is made, but shall take effect on and after the first day in January, next succeeding the day of the date of said alteration. Members who become Residents or Non-Residents by removal into or beyond the limits prescribed in Article XXI., shall be subject to assessments in the class in which they were on the day of the Annual Meeting, as may appear upon the records of the Society or by written notice to the Secretary.

**ARTICLE XXIII.**—Honorary Members, not exceeding twenty in number in all, may be appointed by a unanimous vote of the Board of Direction and such Past-Presidents of the Society as shall be at the time Members of the Society and resident in the United States. A person to be eligible as an Honorary Member shall be a gentleman of acknowledged eminence in some branch of engineering. Honorary Members shall be subject to no fees or assessments and shall not be entitled to vote.

**ARTICLE XXIV.**—There shall be a fund called the Fellowship Fund, ten thousand dollars of which shall be devoted exclusively to the publication of the papers read before the Society. Any persons, whether members or otherwise, if acceptable to the Society, may subscribe thereto. The subscribers to this fund shall be called "Fellows of the Society." A Fellow shall be an acceptable subscriber, who has signified to his proposers a desire to be nominated, and an intention if elected, to become a member of this class.

Persons who are not members and who become Fellows, shall be entitled to all the privileges of the Society, except the right to vote. Members who become Fellows shall, in addition to all the rights they possess as members, be entitled to receive duplicate copies of all the publications of the Society. Fellows shall be elected in the same manner as Honorary Members.

**ARTICLE XXV.**—Whenever any person is elected, the Secretary shall immediately inform him of the same by letter (Form B in the Appendix), and the election of Honorary Members shall be likewise communicated to them by a letter suited to each particular case ; but no person shall be considered an Honorary Member, unless he signify within six months his acceptance of membership.

**ARTICLE XXVI.**—Every person admitted to the Society shall be considered as belonging thereto and liable to the payment of all assessments, until he shall have signified to the Secretary his desire to withdraw ; when, if his dues have been fully paid up, his name shall be erased from the list of members.

Members in arrears for more than one year's annual dues, shall not be allowed to vote until such dues are paid.

**ARTICLE XXVII.**—Any person admitted to the Society, who shall refuse to pay any assessment or other dues to the Society, or who shall neglect the same for the term of six months after due notice is issued (in the form C in the Appendix), shall cease to be a Member.

**ARTICLE XXVIII.**—Upon the written request of ten or more Members, that for cause therein set forth, a person belonging to the Society be expelled, the Board of Direction shall consider the matter, and if there is sufficient reason, shall advise the accused that his resignation will be accepted. He may, upon demand, receive a copy of the charges against him, and present a written defence. Two months after such advice was given, the Board of Direction shall finally consider the case, and if resignation has not been tendered, or a satisfactory defence made, will then notify the member that he will be expelled in one month, unless he elects to appeal from this decision. Appeals will be submitted to the Society by letter ballot. In case no appeal be made, the Board of Direction will expel the member and notify him and the Society of the same, or of the action of the Society on appeal, and the above shall in any event be the only public announcement of the matter.

**ARTICLE XXIX.**—The permanent place for the transaction of the business of this Society shall be in the City of New York.

**ARTICLE XXX.**—The Annual Meeting for the election of officers and hearing the Annual Reports, shall be held on the third Wednesday in January. The Board of Direction shall lay before the meeting a report of the state of the Society, together with a statement by the Treasurer, verified by the Committee on Finance, of the funds of the Society, and the receipts and payments during the year ending on the 31st of December preceding.

**ARTICLE XXXI.**—The annual contributions shall become due for the ensuing year on the first day of January, and shall be payable in advance. It shall be the duty of the Secretary to notify each Member of the amount due for the ensuing year, at the time of giving notice of the Annual Meeting.

**ARTICLE XXXII.**—The Board of Direction may, for sufficient cause, excuse from payment of annual dues any member distinguished in his professional career, and who from ill health, advanced age, or other good reason assigned, is unable to pay such dues; and the Board may remit the whole or part of assessments in arrears, or accept in lieu thereof, desirable additions to the Library and Museum.

**ARTICLE XXXIII.**—Proposed Amendments to this Constitution must be submitted in writing, signed by not less than five Members on or before the first Wednesday in November, and then sent by letter to the several Members of the Society, at least twenty-five days previous to the Annual Meeting. Such Amendments shall be in order for discussion and amendment at such Annual Meeting, and with such Amendments thereto as may have been approved by a majority vote of the Annual Meeting, shall be voted upon by letter ballot, the vote to be counted at the first regular meeting in March. An affirmative vote of two-thirds of all ballots cast shall be necessary to secure the adoption of any Amendment.

## BY-LAWS.

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SECTION 1.—The regular meetings of the Society shall be held on the first Wednesday in each month. There shall be meetings of the Society held on the third Wednesday in each month for professional improvement, and the encouragement of social intercourse among men of practical science, at which papers shall be read and subjects discussed relating to the theory and practice of engineering, and no other business transacted. The Board of Direction may suspend meetings of the Society in the months of July and August.

A Convention of the Society for professional discussion and social intercourse shall be held annually at such place as the Society may determine, and be presided over by a Chairman selected from among members not officers of the Society. During the Convention, a regular meeting of the Society, to be presided over by the officers of the Society, may be held for the transaction of business.

On the evening of the first day of the Convention, there shall be held a meeting to which the public may be invited, and at which the President of the Society shall deliver an address giving a summary of engineering progress during the preceding year.

SECTION 2.—At the regular meetings of the Society, the following order shall be observed in the transaction of business, unless set aside for the time being, by a vote of the members present :

1st. The record of last meeting to be read, approved and signed by the Chairman and Secretary.

2d. Candidates for membership to be balloted for.

3d. Communications received since the last regular meeting to be announced, and read if required.

4th. Communications from members present to be read.

5th. Communications from the Board of Direction to be brought forward.

6th. Reports of Committees to be called for.

7th. Unfinished business to be taken up.

8th. New business to be proposed.

9th. Questions for debate to be discussed.

The same order shall be observed, as far as practicable, at the meetings of the Board of Direction.

SECTION 3.—All decisions of the Chair, on points of order, shall be conclusive, unless reversed on appeal to the meeting.

SECTION 4.—Every motion shall be first stated by the President, before debate or taking the question, and every motion shall be reduced to writing, if the President or any member desires it.

SECTION 5.—When a question is under debate, no motion shall be in order, unless for the previous question; to postpone indefinitely; to postpone to a day certain; to lay on the table; to commit; to amend; or to adopt.

SECTION 6.—A motion to adjourn should always be in order, and shall be decided without debate.

SECTION 7.—If required by one-fifth of the whole number of members present, the ayes and nays upon any question shall be called, and entered upon the journal.

SECTION 8.—No motion for reconsideration shall be in order, unless one of the majority shall move such reconsideration. A motion for reconsideration being put and lost, shall not be renewed, nor shall any subject or vote be a second time reconsidered without unanimous consent.

SECTION 9.—The Board of Direction may call meetings of the Society when they deem it expedient, and shall be bound to do so at the written request of seven members, stating the purpose of such meeting. Ten days' notice shall be given to members of any special meeting; the purpose thereof shall be stated in the notice, and no other business shall be taken up at that meeting.

SECTION 10.—The rooms of the Society shall be open from 9 a. m. to 4 p. m., every business day, unless otherwise determined by the Board of Direction.

SECTION 11.—Every member shall have the privilege of introducing visitors to the room while the Society is not in session, by writing their names and his own, in a book provided for that purpose.

SECTION 12.—A record of all donations to the Society, whether in money, books, maps, models or other articles of value, with the names of the donors, shall be entered by the Secretary in a book provided for that purpose, to be kept at the rooms of the Society.

SECTION 13.—The books, maps, and other property of the Society, shall only be removed from the rooms under such rules and regulations as shall be prescribed by the Committee on Library, and approved by the Board of Direction.

SECTION 14.—A book shall be kept by the Librarian, in which members may enter the title of any book, map or plan, which they may wish to have added to the library.

SECTION 15.—The records of the Society shall at all times be open to members, and such books of accounts shall be kept in its rooms as the Board of Direction may designate.

SECTION 16.—When a paper is presented to the Society, the Secretary shall at once examine it, and report thereon to the Committee on Library, with reference to this standard: Papers containing old matter, readily found elsewhere, those specially meant to advocate personal interests, those carelessly prepared or controverting

established facts, and those purely speculative or foreign to the purposes of the Society, should be rejected. The committee shall then determine whether such paper may go before the Society. They can return it to the writer for correction and emendation, and call to their aid one or more Members of special experience relating to the subject treated, either to advise on the paper or to discuss it. Such papers as in the judgment of the committee should go before the Society shall promptly, upon their acceptance, be printed; others shall be recorded in books provided for the purpose. When, however, the Library Committee does not feel authorized to publish a paper, they may provide an abstract thereof, which, when approved by the author, may be published instead of the original paper.

SECTION 17.—The annual report of the Treasurer shall be certified to, by at least two members of the Committee on Finance.

SECTION 18.—The Board of Direction shall determine the order of its stated and special meetings; provide for an executive committee to act in the absence of a quorum, or during the intervals between the meetings; prescribe regulations for balloting, and generally conduct the business affairs of the Society. The record of the proceedings of the Board of Direction made since the last regular meeting of the Society, shall be read at each regular meeting.

SECTION 19.—A nomination or proposal shall be presented at the next regular meeting of the Board of Direction following its receipt; when it is thereby approved, and the applicant (if for admission as Member, Associate or Junior) classed with his consent, a day shall be fixed for the ballot to be canvassed, which shall be at a regular meeting of the Society, not less than twenty-five days thereafter.

SECTION 20.—When such day is fixed, the Secretary shall conspicuously post in the rooms of the Society, the name and class of the nominee or applicant, his residence, occupation, and the names of his proposers; he shall mail to each Member whose address is known, a notice of the same, with a letter ballot in such form as shall be prescribed by the Board of Direction, and request the recipient to vote thereby or in person in the usual manner on the day fixed, when an open canvass of the votes cast shall be made, and the result announced.

SECTION 21.—The proposers of any rejected candidate may, within three months after such rejection, lay before the Board of Direction written evidence that an error was then made, and ask for a reconsideration of the proposal, which shall be granted on sufficient grounds, and if a ballot has been taken, another shall be ordered.

SECTION 22.—Persons who shall be elected members of this Society after six months of any fiscal year shall have expired, shall pay only one-half of the amount of dues for that fiscal year, otherwise required.

SECTION 23.—Special committees to report upon engineering subjects shall be authorized only by a majority of the votes cast by the Society, and in the following manner: Any resolution proposing such a committee shall be referred to the Board of Direction, which shall examine the same and report to the Society a concise statement of the argument for and against the appointment of such

committee, which statement shall be printed and issued to the Society with a letter ballot; or, if the Board fails to report within one month, the letter ballot shall be issued without comment.

**SECTION 24.**—1st. Votes for officers of the Society at the Annual Meeting in November, may be sent by mail, enclosed in two sealed envelopes, the outer one of which shall be endorsed with the voter's signature, and all such votes shall be counted on the first ballot for officers.

2d. If it should appear that for any office a majority of the votes cast was not for one person, the meeting shall proceed to vote by ballot in the usual way for such officer, the choice of candidates being limited to the two persons not elected for whom the greatest number of votes had been previously cast for such office. In case three or more names have received an equal number of votes, the choice shall be made from among those names.

3d. At the Annual Convention a Nominating Committee of five members, not officers of the Society, shall be appointed by the Convention. This committee shall present to the Board of Direction, on or before the first day of November ensuing, the names of the persons selected by them as candidates for officers. Of these at least one Vice-President, three Directors, the Secretary and the Treasurer shall be resident members.

4th. The Board of Direction shall thereupon cause such list to be posted in the rooms of the Society, and shall issue at least twenty days before the Annual Meeting, a letter ballot containing the names thus proposed.

5th. Any five members, not officers of the Society, may present to the Board of Direction, on or before November 1st, a list of names proposed by them for officers, which list or lists shall also be issued for ballot.

6th.—No member of any Nominating Committee shall be presented by such committee as a candidate for office.

**SECTION 25.**—The President of the Society shall have the general supervision of the business and correspondence of the Society; he shall be an honorary member of all committees, but shall have no vote on such committees.

In all cases where the By-Laws, or resolutions of the Society or of the Board of Direction require specific duties to be performed by the President, the senior resident Vice-President present shall perform such duties in absence of the President, on receiving notice from the President to perform such duties.

**SECTION 26.**—Additions and amendments to these By-Laws shall be proposed in writing and seconded at a regular meeting, and then submitted to vote of the members by letter ballot. The vote shall be canvassed at the second regular meeting thereafter, and two-thirds of all the votes cast, shall be necessary for the adoption of any such addition or amendment.

## APPENDIX.

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### [FORM A.]

I, the undersigned, having been duly elected a.....  
of the American Society of Civil Engineers, do hereby promise that I will be  
governed by the Constitution and By-Laws of said Society, as they are now formed,  
or as they may hereafter be altered, amended or enlarged; and that I will aid in  
advancing the objects of the said Society, and will attend the usual meetings  
thereof as often as I conveniently can; provided that whenever I shall signify in  
writing to the Secretary for the time being, that I am desirous of withdrawing my  
name therefrom, I shall (after the payment of any arrears which may be due by me  
at that period) be free from this obligation.

Witness my hand, this.....  
day of....., 18.....

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### [FORM B.]

AMERICAN SOCIETY OF CIVIL ENGINEERS,  
NEW YORK,.....

SIR :

I have the pleasure to inform you that on the.....  
day of..... you were elected a..... of the  
American Society of Civil Engineers.

To confirm this election it is necessary for you, under Article XX. of the  
Constitution, to subscribe the enclosed obligation, and to pay to the Treasurer of  
the Society the prescribed fee, as stated in the enclosed bill.

Respectfully,  
.....Secretary.

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### [FORM C.]

AMERICAN SOCIETY OF CIVIL ENGINEERS,  
NEW YORK, .....

SIR :

The Board of Direction of the American Society of Civil Engineers has  
directed me to inform you, that your annual contribution thereto has been in  
arrears since.....; the amount being....., and that, by  
the regulations of the Society, unless the same is paid within six months you will  
cease to be a member. I have, therefore, to request that you will order the payment  
thereof.

Respectfully,  
.....Secretary.

## FORM OF APPLICATION.

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The proposal for MEMBER, ASSOCIATE, or JUNIOR, shall contain a statement, over the *candidate's signature*, of his *age, residence*, the nature and term of his *professional service*, and that he will conform to the requirements of membership if elected.

### STATEMENT.

I [*Full Christian names and surname of candidate*] residing at [*City or town, county, state*] being desirous of admission into the American Society of Civil Engineers as [*State class of membership*] submit the following as my professional record :

I was born at [*Place of birth*] on [*Date of birth*] 18   , [*To embody for all classes of members, except Fellows, a concise narrative, with dates, of the candidate's professional career, specifying the positions he has held, the nature and extent of the works in or upon which he has been engaged, giving an idea of their magnitude and importance. All proper names, names of railroads, etc., must be written without abbreviation.*]

### FOR MEMBER, ASSOCIATE OR JUNIOR.

I will conform to the requirements of membership, if elected as [*State class of membership.*]

[*The applicant will sign here his regular signature, and give his present post-office address.*]

On the grounds stated and because we believe him from personal knowledge to be in all respects a proper person to be admitted into the American Society of Civil Engineers, we hereby recommend [*Full name of candidate*] of [*Residence of candidate*] for election as [*Class of membership.*]

[*To be signed by at least five Members of the Society, personally acquainted with the applicant.*]

[Nominations for Honorary Members and for Fellows may be made upon the preceding form of application, but neither Honorary Members nor Fellows are required to present themselves as candidates; those making the nomination are to state the ground therefor. In using the form for this purpose the word "I" will be omitted in the statement, the word "worthy" substituted for "desirous," and the word "we" inserted before the word "submit." The nominee need not sign, but those making a nomination for a Fellow must certify that the nominee will accept if elected.]

[Blanks are furnished on application to the Secretary.]





# List of Members.

MAY, 1882.

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It is particularly requested that every change of address be immediately communicated to

THE SECRETARY,  
AMERICAN SOCIETY OF CIVIL ENGINEERS,  
127 EAST 23d STREET,  
NEW YORK, N. Y.

# American Society of Civil Engineers.

## OFFICERS, 1882.

ASHBEL WELCH, *President.*

JAMES B. EADS, WILLIAM H. PAINE, *Vice-Presidents.*

JOHN BOGART, *Secretary and Librarian.*

J. JAMES R. CROES, *Treasurer.*

## DIRECTORS.

JOSEPH P. DAVIS,

THOMAS L. CASEY,

THOMAS C. KEEFER,

GEORGE S. GREENE, JR.,

GEORGE W. DRESSER.

## PRESIDENTS OF THE SOCIETY.

JAMES LAURIE,  
November 5, 1852 to November 6, 1867.

GEORGE S. GREENE,  
November 3, 1875 to November 7, 1877.

JAMES P. KIRKWOOD,  
November 6, 1867 to August 5, 1868.

E. S. CHESBROUGH,  
November 7, 1877 to November 6, 1878.

WILLIAM J. MCALPINE,  
August 5, 1868 to November 3, 1869.

W. MILNOR ROBERTS,  
November 6, 1878 to November 5, 1879.

ALFRED W. CRAVEN,  
November 3, 1869 to November 1, 1871.

ALBERT FINK,  
November 5, 1879 to November 3, 1880.

HORATIO ALLEN,  
November 1, 1871 to November 5, 1873.

JAMES B. FRANCIS,  
November 3, 1880 to January 18, 1882.

JULIUS W. ADAMS,  
November 5, 1873 to November 3, 1875.

ASHBEL WELCH,  
January 18, 1882.

# List of Members.

NOTE.—H. M., Honorary Member. C. M., Corresponding Member. M., Member.  
A., Associate. J., Junior. F., Fellow.

## HONORARY MEMBERS.

Name.	Address.	Date of Membership.
ALLEN, HORATIO*	( <i>Past-President.</i> ) South Orange, N. J.	Mar. 4, 1874
BARNARD, JOHN G.†	Col. Corps of Engineers; Bvt. Maj. Gen. U. S. A., 33 W. Houston st., New York City, N. Y.	April 7, 1873
DIRKS, JUSTIN	Chief Eng. of the Waterstaat and of the Canal from Amsterdam to the sea, Amsterdam, Holland.	June 2, 1880
ERICSON, JOHN	36 Beach st., New York City, N. Y.	Oct. 2, 1879
HAWKSHAW, SIR JOHN	33 Great George st., S. W., London, England.	Nov. 3, 1880
HUMPHREYS, ANDREW A.,	Brig. Gen. Corps of Engineers; Bvt. Maj. Gen. U. S. A., Washington, D. C.	May 7, 1873
JERVIS, JOHN B.‡	Rome, N. Y.	Dec. 2, 1868
MALÉZIEUX, EMILE	Inspector-General <i>Ponts et Chaussées</i> , Paris, France.	Nov. 3, 1880
ROBINSON, MONCURE	Philadelphia, Pa.	July 6, 1853
WHITTLE, SQUIRE	237 State st., Albany, N. Y.	May 6, 1868
WRIGHT, HORATIO G.	Chief of Engineers, Brig. and Bvt. Maj.-Gen. U.S.A., Washington, D. C.	Mar. 3, 1880

## CORRESPONDING MEMBERS.

Name.	Address.	Date of Membership.
FOX, CHARLES DOUGLAS	6 Delehay st., Westminster, London, England.	June 7, 1871
GLEIM, CHARLES O.	Engineer Rheinische Eisenbahn, Cologne, Germany.	April 5, 1876
PONTZEN, ERNEST	4 rue de Castellane, Paris, France.	Jan. 5, 1876

\* Elected Member, Dec. 4, 1867.

† Elected Member, Sept. 15, 1869.

‡ Fellow.

## MEMBERS.

Name.	Address.	Date of Membership.
ABERT, S. THAYER	U. S. Civil Engineer, 1907 Pennsylvania ave., Washington, D. C.	Sept. 21, 1870
ADAMS, JULIUS W.	(Past-President.) 155 Congress street, Brooklyn, N. Y.	Nov. 5, 1852
ALDRICH, JAMES C.	North Scituate, R. I.	May 7, 1873
ALDRICH, TRUMAN H.	Birmingham, Alabama.	May 4, 1881
ALLEN, CHARLES A.	City Engineer, Worcester, Mass.	June 4, 1879
ALLEN, C. FRANK	Las Vegas, N. M.	Feb. 6, 1878
ALLEN, THEODORE	Sup't Western Boat Building Co., South St. Louis, Mo.	Nov. 16, 1870
ANDERSON, ADNA	Engineer-in-Chief Northern Pacific R. R., St. Paul, Minn.	Sept. 2, 1874
ANDERSON, THOMAS S.	San Antonio, Texas.	Mar. 3, 1880
ANDREWS, JOHN W.	Sup't and Eng. Midland North Carolina Ry., Goldsboro, N. C.	Mar. 1, 1882
ANSLEY, GEORGE D.	City Surveyor, Montreal, Canada.	Sept. 4, 1878
ARCHBALD, JAMES	Ch. Eng. Delaware, Lackawanna & Western R. R., Scranton, Pa.	May 15, 1872
ARCHER, WILLIAM	Eng. Marietta & Cincinnati R. R., Cincinnati, Ohio.	Mar. 2, 1881
ARMINGTON, JAMES H.	Ch. Eng. City Gas Co., Brooklyn, N. Y.	July 6, 1870
ATKINSON, JOHN B.	Sec'y and Treas. St. Bernard Coal Co., Earlington, Ky.	Sept. 5, 1877
ATWOOD, WILLIAM H.	Res. Eng. N. Y., L. E. & W. R. R., Jersey City, N. J.	May 4, 1881
AUCHINCLOSS, WILLIAM S.	209 Church st, Philadelphia, Pa.	Feb. 17, 1869
EVERY, JOHN	Ass't Eng. Bureau of Sewers, Department of Public Works, 31 Chambers st., New York City, N. Y.	Dec. 4, 1867
BACON, JOHN W.	Gen'l Railroad Com'r, Danbury, Conn.	July 12, 1877
BAKER, WILLIAM L.	Eng. Detroit Bridge and Iron Works, Detroit, Mich.	J. Jan. 6, 1875 M. Nov. 6, 1878
BALLARD, ROBERT	Eng. Northern Div. Queensland Rys., Rockhampton, Queensland, Australia.	Sept. 1, 1880
BARBOUR, WILLIAM S.	City Engineer, City Hall, Cambridgeport, Mass.	April 17, 1872

Name.	Address.	Date of Membership.
BARNARD, AUGUSTUS P.	(Care D. Van Nostrand.) 23 Murray st., New York City, N. Y.	April 5, 1876
BARNARD, JOHN F.	Gen. Sup't Kansas City, St. Joseph & Council Bluffs R. R., St. Joseph, Mo.	Sept. 1, 1881
BARNES, OLIVER W.	57 Broadway, New York City, N. Y.	July 6, 1881
BATES, ONWARD	Bridge Entrance, St. Louis, Mo.	Jan. 4, 1882
BAXTER, GEORGE S.	209 East 18th st., New York City, N. Y.	{ J. May 12, 1875 { M. May 3, 1876
BECKER, MAX J.	Ch. Eng. P. C. & St. Louis R. R., Pittsburg, Pa.	Aug. 7, 1872
BECKWITH, ARTHUR	Architect and Civil Engineer, Rooms 75, 76 and 77, Tribune Bldg., New York City, N. Y.	Dec. 16, 1868
BECKWITH, LEONARD F.	President of the Fire-proof Building Co. of New York, Rooms 75, 76 & 77, Tribune Bldg., New York City, N. Y.	Dec. 16, 1868
BEEBOUT, EDWARD N.	Canton, Ohio.	Aug. 7, 1872
BELKNAP, MORRIS S.	Sup't Mobile & Montgomery Ry., Selma Div. of West. R. R. (of Ala.), Pine Apple Div. Pensacola & Selma R. R., L. & N. R. R., Montgomery, Ala.	Aug. 7, 1872
BENSON, FREDERICK S.	Eng. Nassau Gas Light Co., cor. Kent ave. and Cross st., Brooklyn, N. Y.	Feb. 7, 1877
BENTLEY HENRY A.	Newport, R. I.	Mar. 2, 1881
BENYAURD, WILLIAM H. H.	Maj. Corps of Engineers, U. S. A., Memphis, Tenn.	Nov. 3, 1875
BERGEN, VAN BRUNT	Ass't Eng. Board of Public Works, City Hall, Brooklyn, N. Y.	June 17, 1868
BILLIN, CHARLES E.	Illiana, Edgar Co., Ill.	{ J. April 5, 1876 { M. July 3, 1878
BISHOP, GEORGE H.	Eng. Water Works, Middletown, Conn.	Aug. 7, 1872
BISSELL, H.	Master of Maintenance of Way, Eastern R. R., Salem, Mass.	Sept. 15, 1869
BLACKWELL, CHARLES	Sup't Motive Power, Norfolk & Western Ry., Roanoke, Va.	Sept. 7, 1881
BLAISDELL, ANTHONY H.	Western Boat Building Co., South St. Louis, Mo.	Mar. 3, 1880
BLAND, JOHN C.	259 S. 4th st., Philadelphia, Pa.	{ J. June 1, 1875 { M. June 4, 1879
BLAND, GEORGE P.	3214 Woodland ave., West Philadelphia, Pa.,	{ J. April 7, 1875 { M. May 4, 1881
BLICKENSDEKFER, JACOB	Ch. Eng., Union Pacific R. R., Omaha, Neb.	June 1, 1881
BLICKENSDEKFER, ROBERT	Div. Eng. and Supt. Construction Utah & Northern Ry., Silver Bow Junction, Montana.	June 1, 1881
BLUNDEN, HENRY D.	Pr. Ass't Eng., N. Y., L. E. & W. R. R., 187 West st., N. Y. City, N. Y.	{ J. Jan. 5, 1876 { M. Feb. 4, 1880

Name.	Address.	Date of Membership.
BOGART, JOHN	(Secretary.) 127 East 23d st., New York City, N. Y.	Feb. 17, 1869
BOGUE, VIRGIL G.	Portland, Oregon.	Sept. 15, 1869
BOLLER, ALFRED P.	Civil Engineer, 71 Broadway, New York City, N. Y.	Dec. 4, 1867
BONNETT, WILLIAM W.	Waterbury, Conn.	Sept. 4, 1872
BONNYN, WM. WINGFIELD	26 Hospital st., Montreal, Canada.	Jan. 4, 1882
BONTECOU, DANIEL	P. O. Box L, Kansas City, Mo.	Nov. 5, 1879
BONZANO, ADOLPHUS	(Clarke, Reeves & Co.) Phoenixville, Pa.	Aug. 7, 1872
BOUSCAREN, LOUIS G. F.	Con. and Pr. Eng. Cin. South. R. R., 134 Vine st., Cincinnati, Ohio.	April 7, 1875
BOYD, CHARLES R.	Wytheville, Wythe County, Va.	April 6, 1881
BRADLEY, WILLIAM H.	Sup't. Sewers, Boston, Mass.	Feb. 5, 1879
BRECKENRIDGE, CABELL	Eng. Alabama Great Southern R. R., Chattanooga, Tenn.	June 1, 1881
BRIDGES, LYMAN	Ch. Eng. California Central R. R., 702 Market st., San Francisco, Cal.	Dec. 1, 1880
BRIGGS, ROBERT	Civil and Mech. Eng., 1125 Girard st., Philadelphia, Pa.	Oct. 19, 1870
BRIGGS, ROSWELL E.	Mexican Central Ry., San Luis Potosi, Mexico.	Sept. 15, 1869
BRITTAIN, ALFRED	Ass't City Surveyor, City Hall, Montreal, Canada.	Nov. 2, 1881
BROADHEAD, CALVIN E.	White Haven, Pa.	Feb. 21, 1872
BROOKS, THOMAS B.	Box 298, Newburgh, N. Y.	May 17, 1871
BROUGH, REDMOND J.	City Engineer, Toronto, Canada.	Sept. 1, 1880
BROWN, CHARLES O.	52 William st., Room 9, New York City, N. Y.	{ J. Jan. 6, 1875 M. Nov. 7, 1877
BRUNER, DANIEL P.	110 North 2d st., Harrisburgh, Pa.	{ J. Sept. 6, 1876 M. May 7, 1879
BRUSH, CHARLES B.	13 Newark st., Hoboken, N. J.	{ A. Sept. 6, 1871 M. Sept. 5, 1877
BUCK, LEFFERT L.	124 Bedford ave., Brooklyn, N. Y.	Feb. 3, 1875
BUDGE, ENRIQUE	Valparaiso, Chili.	Feb. 1, 1882
BUEL, RICHARD H.	206 Broadway, Room 47, New York City, N. Y.	April 17, 1872
BURDEN, JAMES A.	Burden Iron Works, Troy, N. Y.	July 2, 1879
BURNET, GEORGE, JR.	Ass't Eng. Indiana, Bloomington & Western Ry., Indianapolis, Ind.	March 1, 1882
BURR, JAMES D.	Topeka, Kansas.	April 5, 1876
CAMPBELL, ALLAN	Comptroller Finance Dept., City Hall, New York City, N. Y.	Feb. 19, 1868
CAMPBELL, JOHN C.	715 Madison ave., New York City, N. Y.	June 2, 1869
CANFIELD, EDWARD	N. Y., L. E. & W. R. R., Buffalo, N. Y.	Dec. 3, 1879
CARTWRIGHT, ROBERT	14 Arnold Park, Rochester, N. Y.	July 10, 1872
CASEY, THOMAS L.	(Director.) Lt. Col. Corps of Engs., Bvt. Col. U. S. A., Washington, D. C.	Jan. 6, 1875

Name.	Address.	Date of Membership.
CASSATT, ALEXANDER J.	Vice-Pres. Penn. R. R., 233 S. 4th st., Philadelphia, Pa.	Oct. 7, 1868
CHANUTE, OCTAVE	Ch. Eng. N. Y., L. E. & W. R. R., 21 Cortlandt st., New York City, N. Y.	Feb. 19, 1868
CHAPHE, ANDREW J.	Ch. Mech'l Eng. Water Works, St. Louis, Mo.	Feb. 4, 1880
CHASE, JOSIAH G.	Cambridgeport, Mass.	June 1, 1870
CHESBROUGH, E. S.	(Past-President.) 175 La Salle st., Chicago, Ill.	June 17, 1868
CHILDS, JAMES E.	Gen. Supt. New York, Ont. & Western Ry., Middletown, N. Y.	Dec. 4, 1878
CHITTENDEN, SAMUEL H.	East River, Conn.	April 5, 1876
CHRISTIE, JAMES	265 So. 4th st., Philadelphia, Pa.	May 7, 1873
CHURCH, BENJAMIN S.	Ass't Eng. Croton Aqueduct, Dep't Public Works, 31 Chambers st., New York City, N. Y.	Dec. 4, 1867
CISNEROS, FRANCIS J.	311 W. 33d st., New York City, N. Y.	May 15, 1872
CLARK, JACOB M.	Eng. Central R. R. of New Jersey, 119 Liberty st., New York City, N. Y.	Jan. 29, 1868
CLARKE, ELIOT C.	Prin. Ass't Eng. in charge of Improved Sewerage Works, 74 Tremont st., Room 13, Boston, Mass.	Sept. 4, 1878
CLARKE, FREDERICK W.	80 Dearborn st., Chicago, Ill.	Nov. 7, 1878
CLARKE, H. WADSWORTH,	Eng. in charge of New York & Pennsylvania Boundary Survey, 11 Granger Block, Syracuse, N. Y.	Mar. 15, 1871
CLARKE, THOMAS C.	49 William st., Room 58, New York City, N. Y.	Mar. 18, 1868
CLEEMANN, THOMAS M.	340 S. 21st st., Philadelphia, Pa.	Oct. 1, 1879
COFFIN, AMORY	Eng. Phoenix Iron Co., Phoenixville, Pa.	Mar. 3, 1875
COFFIN, WILLIAM B.	Res. Eng. Susq. Division, N. Y., L. E. & W. R. R., Elmira, N. Y.	Nov. 6, 1872
COGSWELL, WILLIAM B.	109 Willow st., Syracuse, N. Y.	{ A. Feb. 15, 1870 M. Oct. 16, 1872
COHEN, MENDES	177 N. Charles st., Baltimore, Md.	Dec. 4, 1867
COLLINGWOOD, FRANCIS	Ass't Eng. East River Bridge, 279 Front st., New York City, N. Y.	Mar. 10, 1869
COMSTOCK, CYRUS B.	Major Corps of Engineers, Bvt. Brig. Gen. U. S. A., Detroit, Mich.	Sept. 1, 1880
CONSTABLE, CASIMIR	Constableville, Lewis Co., N. Y.	June 17, 1868
COOLMAN, DEWITT C.	Ravenna, Ohio.	Mar. 4, 1874
COOPER, THEODORE	Civil and Mech. Engineer, 35 Broadway, New York City, N. Y.	Mar. 4, 1874
COPELAND, GEORGE M.	24 Park Place, New York City, N. Y.	Nov. 1, 1871
CORTHELL, ELMER L.	Ch. Eng. New York, West Shore, & Buffalo R. R., 15 Broad st., New York City, N. Y.	Sept. 2, 1874



Name.	Address.	Date of Membership.
CORYELL, MARTIN	Civil and Mining Engineer, Lambertville, N. J.	Dec. 4, 1867
COTTON, JOSEPH P.	Civil Engineer, Newport, R. I.	June 7, 1876
COX, ABRAHAM B.	Cherry Valley, N. Y.	May 7, 1873
COXE, ECKLEY B.	Drifton, Jeddo P. O., Lucerne Co., Pa.	Feb. 7, 1877
CROES, J. JAMES R.	( <i>Treasurer.</i> ) 63 Bleecker st., New York City, N. Y.	Dec. 4, 1867
CROSBY, HORACE	New Rochelle, N. Y.	Feb. 17, 1869
CROSBY, WILSON	Bangor, Me.	Sept. 15, 1869
CROWELL, J. FOSTER	Ass't Eng. Penna. R. R., East Liberty, Pittsburg, Pa.	Dec. 1, 1880
CULYER, JOHN Y.	Ch. Eng. Brooklyn Parks, Box 218, Brooklyn, N. Y.	Feb. 17, 1860
CUNNINGHAM, DAVID W.	Eng. Water Board, Room 1, City Hall, Minneapolis, Minn.	May 7, 1873
CUNNINGHAM, JAMES H.	University Club, Edinburgh, Scotland.	Aug. 6, 1879
CURRIE, DANIEL McN.	U. S. Ass't Eng., 404 Market st., St. Louis, Mo.	May 5, 1880
CUSHING, OLIVER E.	Engineer Lowell Gas Light Co., Lowell, Mass.	July 10, 1872
DARRACH, CHARLES G.	100 North 39th st., Philadelphia, Pa.	Jan. 5, 1876
DAVIS, CHARLES	79 Western ave., Alleghany City, Pa.	Sept. 15, 1869
DAVIS, CHARLES E. L. B.	Capt. Corps of Engineers, U. S. A., Engineer 10th Light House District, Buffalo, N. Y.	July 12, 1877
DAVIS, CHESTER B.	Ch. Eng. Water Works, Madison, Mo.	Feb. 1, 1882
DAVIS, JOSEPH P.	( <i>Director.</i> ) 28 East 20th st., New York City, N. Y.	Jan. 29, 1868
DEFREES, MORRIS M.	Eng. in Charge Bridges and Buildings, Ind., B. & W. R. R., and Ohio So. R. R. Co., Indianapolis, Ind.	Mar. 3, 1880
DEFUNIAK, FREDERICK	Gen. Mang. Louisville & Nashville R. R., Louisville, Ky.	May 7, 1873
DEMPSTER, ALEXANDER	Cor. Stanton and Euclid ave., Pittsburg, Pa.	Nov. 5, 1879
DICKINSON, POMEROY P.	237 Broadway, New York City, N. Y.	Jan. 17, 1872
DOANE, EDWIN A.	Chief Eng. Rome, Watertown & Ogdensburgh R. R., Oswego, N. Y.	June 7, 1876
DOANE, WALTER A.	Prin. Ass't Eng. Rome, Watertown & Ogdensburgh R. R., Oswego, N. Y.	Sept. 7, 1881
DORSEY, EDWARD B.	61 Broadway, New York City, N. Y.	June 4, 1879
DRESSER, GEORGE W.	( <i>Director.</i> ) 35 University Place, New York City, N. Y.	July 5, 1876
DUBARRY, JOSEPH N.	Ass't to Pres't Penna. R. R. Co., 233 South 4th st., Philadelphia, Pa.	Jan. 6, 1875

Name.	Address.	Date of Membership.
DUN, JAMES	Ch. Eng. St. Louis & San Francisco R.R., Neodesha, Wilson Co., Kansas.	June 7, 1876
DUNCKLEE, JOHN B.	Ass't U. S. Eng., 1907 Penn. ave., Washington, D. C.	April 2, 1873
DURHAM, C. WHEELER	19 Fifth ave., New York City, N. Y.	April 4, 1877
EADS, JAMES B.	( <i>Vice-President.</i> ) Room 502, Chamber of Commerce, St. Louis, Mo.	Dec. 16, 1868
EARLEY, JOHN E.	Locating Engineer, N. M. & A. R. R., Tucson, Arizona.	April 5, 1876
EARNSHAW, HENRY	Civil and Hydraulic Engineer, Cincinnati, Ohio.	Mar. 3, 1869
ECKART, WILLIAM R.	P. O. Box 1587, San Francisco, Cal.	Jan. 5, 1881
EDWARDS, NATHANIEL M.	Appleton, Wis.	June 14, 1874
EGLESTON, THOMAS	Professor School of Mines, Columbia College, 35 W. Washington Square, New York City, N. Y.	March 5, 1879
ELLIOT, CHARLES D.	Somerville, Mass.	Aug. 7, 1872
ELLIS, NATHANIEL W.	Box 53, Manchester, N. H.	Feb. 2, 1881
ELLIS, S. CLARENCE	City Hall, Boston, Mass.	Aug. 7, 1872
ELLIS, THEODORE G.	Hartford, Conn.	Feb. 17, 1869
ELY, THEODORE N.	Supt. Motive Power, Penn. R. R., Altoona, Pa.	Mar. 2, 1881
EMERSON, GEORGE D.	Prof. of Engineering, School of Mines and Metallurgy, Rolla, Mo.	Sept. 18, 1872
EMERY, CHARLES E.	Consulting Eng., 16 Cortlandt st., New York City, N. Y.	May 6, 1874
ENDICOTT, MORDECAI T.	Civil Eng. U. S. N., Navy Yard, League Island, Pa.	April 7, 1877
ENGLE, ROBERT L.	Rio Grande Ex. Co., Gunnison, Col.	Sept. 7, 1881
EVANS, WALTON W.	New Rochelle, N. Y.	Dec. 4, 1867
FALCONNET, EUGENE F.	Pres. and Eng. N. & T. R. R., Nashville, Tenn.	June 3, 1874
FANNING, JOHN T.	360 Manchester st., Manchester, N. H.	Aug. 7, 1872
FARQUHAR, FRANCIS U.	Major of Engs., Bvt. Lt.-Col. U. S. A., U. S. Light House Board, Washington, D. C.	July 10, 1872
FELTON, SAMUEL M., JR.	Gen. Mang. New York & New England R. R., Boston, Mass.	Jan. 4, 1882
FIELD, GEORGE S.	Mang. Central Bridge Co., Buffalo, N. Y.	April 7, 1880
FINK, ALBERT	( <i>Past-President.</i> ) Com. of Trunk Lines, 346 Broadway, New York City, N. Y.	July 20, 1870
FINK, RUDOLPH	Gen. Mang. Mexican Central Ry., City of Mexico, Mexico.	Sept. 21, 1870

Name.	Address.	Date of Membership.
FINNEY, FREDERICK N.	Gen. Mang. Wisconsin Central R. R., Milwaukee, Wis.	Sept. 3, 1879
FIRMSTONE, FRANK	Agent Glendon Iron Co., Easton, Pa.	Aug. 7, 1878
FISHER, CHARLES H.	Ch. Eng. N. Y. Central & H. R. R. R., Albany, N. Y.	July 7, 1869
FISHER, CLARK	Civil and Mech'l Engineer, Trenton, N. J.	Oct. 19, 1870
FLAD, HENRY	City Hall, St. Louis, Mo.	Feb. 15, 1871
FLAGG, J. FOSTER	Div. Eng. Mexican National R. R., Colima, Mexico.	Oct. 7, 1874
FLEMING, SANDFORD	Ottawa, Ontario, Canada.	Sept. 18, 1872
FLINT, EDWARD A.	11 Tremont Bank Building, Boston, Mass.	May 18, 1870
FOGG, CHARLES E.	Eng. Catskill Mt. R. R., Catskill, N.Y.	Oct. 16, 1872
FORCE, CYRUS G., JR.	Cleveland, O.	Feb. 6, 1878
FORNEY, MATTHIAS N.	Railroad Gazette, 73 Broadway, New York City, N. Y.	Sept. 6, 1871
FORSYTH, ROBERT	Sup't Bessemer Steel Works, North Chicago Rolling Mill, Chicago, Ill.	May 12, 1875
FOSTER, WILBUR F.	City Engineer, Burns Block, Nashville, Tenn.	May 7, 1873
FOWLER, CHARLES E.	City Engineer, Box 303, New Haven, Conn.	May 3, 1876
FRANCIS, JAMES B.	(Past-President.) Ch. Eng., Proprs. of Locks and Canals on Merrimack River, Lowell, Mass.	Nov. 5, 1852
FRANKLIN, WILLIAM B.	Hartford, Conn.	April 1, 1874
FRAZIER, JAMES L.	Eng's Office, Louisville, New Albany & St. Louis R. R., Louisville, Ky.	Sept. 1, 1880
FTELEY, ALPHONSE	Ch. Ass't City Engineer, Boston, Mass.	Jan. 5, 1876
FUERTES, ESTEVAN A.	Dean of the Faculty of Engineering, Cornell University, Ithaca, N. Y.	Feb. 17, 1869
FULLER, SIDNEY T.	Ch. Eng. N. D. Texas Mexican Ry., Galveston, Texas.	May 3, 1871
GARDNER, G. CLINTON	Gen. Mang. Mex. Nat. Railway, 47 William st., New York City, N. Y.	Nov. 3, 1875
GILBERT, CHARLES P.	Ass't U. S. Eng., 26 Washington ave., Detroit, Mich.	Feb. 6, 1878
GILLMORE, QUINCY A.	Lieut. Col. Corps of Engs., Bvt. Maj.-Gen. U. S. A., 33 West Houston st., New York City, N. Y.	Dec. 2, 1868
GLASKIN, EDWIN E.	52 Queen Victoria st., London, England.	{ J. April 5, 1876 M. May 4, 1881
GLOVER, OLIVER L.	Pittsfield, Mass.	April 3, 1878
GOAD, CHARLES E.	102 St. Francois Xavier st., Montreal, Canada.	Sept. 7, 1881

Name.	Address.	Date of Membership.
GODWIN, BRYANT	19 East 37th st., New York City, N. Y.	April 4, 1877
GOLAY, PHILIP	Ass't U. S. Eng., Paducah, Ky.	Sept. 5, 1877
GOODWIN, H. STANLEY.	Ass't Gen. Supt. Lehigh Valley R. R., Bethlehem, Pa.	July 20, 1870
GOODWIN, JOHN M.	Eng. Sharpsville R. R., and Sharpsville & Lake Shore R. R., Sharpsville, Mercer Co., Pa.	Sept. 4, 1872
GOTTLIEB, ABRAHAM	President Keystone Bridge Co., Pittsburgh, Pa.	Sept. 4, 1872
GORDON, ROBERT	Henzada, British Burmah.	Feb. 4, 1882
GOULD, JAMES P.	Buxton P. O., Traill Co., Dakota.	Feb. 17, 1869
GRAFF, FREDERICK	Hydraulic Engineer, 1337 Arch st., Philadelphia, Pa.	May 7, 1873
GRANT, WILLIAM H.	999 Park ave., New York City, N. Y.	July 2, 1873
GRAY, GEORGE E.	Ch. Eng. Southern Pacific R. R., San Francisco, Cal.	July 2, 1873
GRAY, SAMUEL M.	Providence, R. I.	May 15, 1872
GREENE, BENJAMIN H.	Ch. Eng. New Orleans Pacific R. R., Shreveport, La.	May 1, 1878
GREENE, CHARLES E.	Prof. of Civil Engineering, University of Michigan, Ann Arbor, Mich.	Jan. 4, 1882
GREENE, DAVID M.	21 First st., Troy, N. Y.	May 20, 1868
GREENE, GEORGE S.	(Past President.) Care Am. Soc. C. E. 127 East 23d st., New York City, N. Y.	Nov. 5, 1852
GREENE, GEORGE S., JR.	(Director.) Ch. Eng. Department of Docks, 119 Duane st., New York City, N. Y.	Dec. 4, 1867
GREENOUGH, MALCOLM S.	Boston Gas Co., 24 West st., Boston, Mass.	Dec. 4, 1878
GRIFFEN, JOHN	Phoenixville, Pa.	April 15, 1868
GUDE, ALBERT V.	Ass't Ch. Eng. Louisville & Nashville R. R., Louisville, Ky.	May 7, 1873
GUNNELL, WILLIAM C.	600 Twentieth st., Washington, D. C.	Feb. 7, 1877
GZOWSKI, CASIMIR S.	Toronto, Canada.	Dec. 2, 1868
HAIGHT, STEPHEN S.	Ass't Eng. Department of Public Parks, West Farms, New York City, N. Y.	June 1, 1881
HAMBLETON, FRANCIS H.	Consulting Engineer, 8 South st., Baltimore, Md.	Mar. 5, 1873
HAMILTON, WILLIAM G.	24 Broadway, New York City, N. Y.	Oct. 7, 1868
HANNAFORD, EDMUND P.	Ch. Eng. Grand Trunk R. R., Montreal, Canada.	Sept. 18, 1872
HARDING, GEORGE E.	40 Exchange Place, New York City, N. Y.	Mar. 3, 1875
HARDING, HENRY	Salem, Mass.	May 7, 1873
HARLOW, JAMES H.	Eng. Monongahela Navigation Co., 81 Wood st., Pittsburgh, Pa.	Mar. 4, 1874

Name.	Address.	Date of Membership.
HARRIS, HENRIQUE	Ch. Eng. New York & Manhattan Beach R. R., 212 Adelphi st., Brooklyn, N. Y.	Dec. 3, 1879
HARRIS, ROBERT L.	(Care David Kimball.) Portsmouth, N. H.	May 3, 1876
HARRIS, WILLIAM P.	Supt. Western Div. Chesapeake & Ohio R. R., Huntington, W. Va.	June 1, 1881
HARROD, BENJAMIN M.	Member Mississippi River Commission, New Orleans, La.	April 4, 1877
HASELL, BENTLEY D.	Gen'l Agent Great Southern Line, Pier 27, N. R., New York City, N. Y.	July 3, 1878
HASLETT, SULLIVAN	Smith Building, 5 Cortlandt st., New York City, N. Y.	June 4, 1879
HASWELL, CHARLES H.	29 Broadway, New York City, N. Y.	Jan. 29, 1868
HAVEN, WILLIAM A.	Engineer in charge of Construction, Buffalo Division, N. Y., L. E. & W. R. R., Buffalo, N. Y.	Mar. 5, 1873
HEMBERLE, EDWARD	Eng. Delaware Bridge Co., Major Block, Chicago, Ill.	Jan. 7, 1874
HENRY, D. FARRAND	Detroit, Mich.	July 7, 1875
HERING, RUDOLPH	Civil Engineer, 3704 Baring st., Philadelphia, Pa.	Jan. 5, 1876
HERMANY, CHARLES	Ch. Eng. Water Works, Louisville, Ky.	Jan. 6, 1869
HERSCHEL, CLEMENS	Hydraulic Eng. Holyoke Water Power Co., Holyoke, Mass.	April 21, 1869
HEUER, WILLIAM H.	Capt. Corps of Engineers U. S. A., New Orleans, La.	Mar. 3, 1880
HIDER, ARTHUR	Ass't U. S. Engineer, Duncansby P. O., Miss.	Sept. 7, 1881
HILGARD, JULIUS E.	Supt. U. S. Coast and Geodetic Survey, Washington, D. C.	July 10, 1872
HILL, JOHN W.	Consulting Engineer, 5th and Race sts., Room 21, Cincinnati, O.	Feb. 3, 1875 M. Apr. 5, 1876
HILL, WARREN E.	Continental Iron Works, Greenpoint, N. Y.	May 7, 1873
HILLMAN, CHARLES F.	Ch. Eng. Santiago & Curico and Palmilla Rys., Ferro Carril del Sur, Santiago, Chile.	July 5, 1876
HILTON, CHARLES	105 Lancaster st., Albany, N. Y.	Sept. 15, 1869
HOE, RICHARD M.	31 Gold st., New York City, N. Y.	Oct. 1, 1873
HOOD, WILLIAM	Ass't Ch. Eng. Southern Pacific R. R., San Francisco, Cal.	Sept. 6, 1876
HOWARD, FREDERICK B.	57 Lafayette ave., Detroit, Mich.	J. Mar. 3, 1875 M. Nov. 6, 1878
HOUSTON, JOHN	Ch. Eng. L. G., C. & P. & V. R. R., La Guira, Venezuela.	May 6, 1868
HOWE, MILTON G.	Houston, Texas.	Oct. 16, 1872
HUGHES, WILLIAM M.	Eng. of Bridges, New York, Chicago & St. Louis Ry., cor. St. Clair and Bank sts., Cleveland, O.	June 2, 1880

Name.	Address.	Date of Membership.
HUTTON, WILLIAM R.	46 Lexington st., Baltimore, Md.	Jan. 8, 1873
HYDE, WILLIAM B.	Civil Eng., Tubbs Hotel, Oakland, Cal.	July 12, 1877
JAMES, JOHN C.	Ch. Eng. Northwestern Grand Trunk Ry., Battle Creek, Mich.	Mar. 1, 1876
JAMES, SAMUEL L.	32 Carondelet st., Lock Box 437, New Orleans, La.	May 1, 1878
JAYCOX, THOMAS W.	City Engineer, P. O. Box 189, Leadville, Col.	Jan. 4, 1882
JOHN, IRVIN	20 Nassau st., Room 57, New York City, N. Y.	Oct. 1, 1879
JOHNSON, LORENZO M.	Ass't to Pres't Pullman Palace Car Co., Chicago, Ill.	J. Mar. 3, 1875 M. April 7, 1880
JOHNSON, THOMAS H.	Eng. to Contractors Indiana State House, 75 West Market st., Indianapolis, Ind.	Sept. 5, 1877
JOHNSTON, J. HOWARD	Lima, Peru.	Mar. 1, 1876
JONES, WASHINGTON	Sup't Port Richmond Iron Works, Philadelphia, Pa.	Oct. 7, 1874
JORDAN, GABRIEL	Vice-Pres't and Gen. Mang. Houston & Texas Central Ry., Houston, Texas.	Sept. 18, 1872
JUDSON, JOHN A.	(Porter & Judson.) Bellevue ave., Newport, R. I.	May 6, 1874
JUDSON, WILLIAM P.	Ass't U. S. Engineer, Oswego, N. Y.	Sept. 7, 1881
KATTÉ, WALTER	Ch. Eng. N. Y., Ont. & Western Ry., and North River Const. Co., Mills Building, Broad st., New York City, N. Y.	Oct. 7, 1868
KEEFER, SAMUEL	Brockville, Canada.	Jan. 6, 1869
KEEFER, THOMAS C.	(Director.) Ottawa, Canada.	April 4, 1877
KEITH, GEORGE T.	Olean, N. Y.	May 4, 1881
KELLEY, WILLIAM E.	Civil Engineer, New Brunswick, N. J.	Feb. 17, 1869
KELLOGG, CHARLES	(Kellogg & Maurice.) Athens, Pa.	June 2, 1880
KENNEDY, JOHN	Ch. Eng. Montreal Harbor and Ship Channel Improvements, Montreal, Canada.	Sept. 1, 1875
KENNEDY, WILLIAM H.	Prin. Ass't Eng. Oregon Pacific R. R., Walla Walla, Washington Territory.	Sept. 6, 1871
KIMBERLEY, MOSES C.	Div. Supt. D. & R. G. Ry., South Pueblo, Col.	May 7, 1873
KINGSLEY, MARVIN W.	354 Superior st., Cleveland, Ohio.	July 3, 1878
KINNEY, EDWARD C.	Ch. Eng. St. Louis, Des Moines & Northern R. R., Des Moines, Ia.	May 3, 1882
KINSLEY, THOMAS P.	Le Roy, N. Y.	Feb. 5, 1873
KNAP, JOSEPH M.	365 West st., New York City, N. Y.	April 5, 1882

Name.	Address.	Date of Membership.
KNAPP, LOUIS H.	Civil Engineer, 410 Franklin st., Buffalo, N. Y.	Mar. 4, 1874
KNEASS, STRICKLAND	Ass't to Pres't Penn. R. R., 233 South Fourth st., Philadelphia, Pa.	Nov. 18, 1868
KNIGHT, WILLIAM B.	Civil Engineer, Kansas City, Mo.	{ J. Jan. 6, 1875 M. Jan. 7, 1880
LATCHA, JACOB A.	Ch. Eng. New York, Chicago & St. Louis Ry., 32 Board of Trade, Cleveland, Ohio.	May 7, 1873
LATIMER, CHARLES	Ch. Eng. New York, Penna. & Ohio R. R., Cleveland, Ohio.	April 5, 1876
LATROBE, CHARLES H.	10 South st., Baltimore, Md.	Nov. 16, 1870
LEACH, SMITH S.	1st Lieut. Corps Engineers, U. S. A., 2828 Washington ave., St. Louis, Mo.	July 7, 1880
LEAVITT, ERASMUS D., JR.	604 Main st., Cambridgeport, Mass.	July 2, 1873
LECONTE, LOUIS J.	P. O. Box 358, Oakland, Cal.	April 4, 1877
LEHNARTZ, FREDERICK W.	Civil and Mining Engineer, Lake City, Col.	Aug. 6, 1879
LESAGE, LOUIS	Sup't Water Works, Montreal, Canada.	Sept. 7, 1881
LEVERICH, GABRIEL	Box 174, South Orange, N. J.	July 6, 1870
LEWIS, EUGENE C.	Sec'y and Treas. Sycamore Manuf. Co., Nashville, Tenn.	Mar. 5, 1873
LEWIS, SIDNEY F.	Ass't State Engineer, 289 Royal st., New Orleans, La.	May 4, 1881
LIGHT, ALEXANDER L.	Ch. Eng. Gov't Rys., Province of Quebec, Quebec, Canada.	Sept. 7, 1881
LINDENTHAL, GUSTAV	Ch. Eng. Monongahela Bridge, Pittsburg, Pa.	May 3, 1882
LINVILLE, JACOB H.	4117 Walnut st., Philadelphia, Pa.	Mar. 3, 1875
LONG, THOMAS J.	Dept. of Docks, Foot of West 24th st., New York City, N. Y.	{ J. Nov. 3, 1875 M. Jan. 7, 1880
LOOMIS, HORACE	Ass't Eng. Dept. of Public Works, 31 Chambers st., New York City, N. Y.	Nov. 5, 1879
LOVETT, THOMAS D.	75 West Third st., Cincinnati, Ohio.	May 3, 1871
LOTZ, WILLIAM H.	57 Metropolitan Block, Chicago, Ill.	Sept. 1, 1875
LOW, GORHAM P., JR.	Supt. Road Dept. E. C. & N. R. R., Norfolk, Va.	April 21, 1869
LOWTHROP, FRANCIS C.	152 Greenwood ave., Trenton, N. J.	Nov. 2, 1853
MACDONALD, CHARLES	Pres. Delaware Bridge Co., 52 Wall st., New York City, N. Y.	Sept. 15, 1869
MACLAY, WILLIAM W.	132 E. 65th st., New York City, N. Y.	Nov. 6, 1872
MACLEOD, JOHN	Gen. Supt. L. N. A. & C. R. R., 547 Second st., Louisville, Ky.	July 10, 1872

Name.	Address.	Date of Membership.
MACNAUGHTON, JAMES	(Osgood & MacNaughton, Engineers and Contractors.) 37 State st., Albany, N. Y.	May 5, 1880
MACRITCHIE, CHARLES	169 LaSalle st., Chicago, Ill.	April 5, 1876
MANLEY, HENRY	Ass't City Eng., Boston, Mass.	June 2, 1880
MARSLAND, EDWARD	Sing Sing, N. Y.	Feb. 6, 1878
MARTIN, CHARLES C.	First Ass't Eng. East River Bridge, 21 Water st., Brooklyn, Y. Y.	July 10, 1872
MASTEN, CORNELIUS S.	Div. Eng. in charge Bridges and Buildings, Western Div. Wabash Ry., St. Louis, Mo.	Sept. 6, 1871
MAURICE, CHARLES S.	Athens, Bradford Co., Pa.	May 15, 1872
MAXWELL, JAMES R.	Ch. Eng. and Sup't Const. Danville, Olney & Ohio Ry., Olney, Ill.	April 17, 1872
MAY, WILLIAM A.	Lock Box 173, Scranton, Pa.	July 6, 1881
MCALPINE, CHARLES L.	(Care Am. Soc. C. E.) 127 E. 23d st., New York City, N. Y.	Dec. 4, 1867
MCALPINE, WILLIAM J.	(Past-President.) Bay Ridge, Kings Co., N. Y.	Feb. 2, 1853
MCCCLINTOCK, WILLIAM H.	Supt. Road Dept. L. & N. R. R., Louisville, Ky.	April 5, 1876
MCCOMB, DAVID E.	Ass't Eng. District Commissioners, Washington, D. C.	Feb. 7, 1877
MCCREA, JAMES	Supt. New York Division, Penn. R. R., Jersey City, N. J.	Sept. 3, 1873
MCDOWELL, NATHAN M.	Civil Engineer, Alleghany City, Pa.	April 4, 1877
McKEE, CHARLES H.	Ass't Eng. Del. & Hudson Canal Co., French Mountain, N. Y.	June 4, 1879
McKENZIE, THEODORE H.	Sec'y Peck, Stow & Wilcox Co., Southington, Conn.	Sept. 7, 1881
McKEON, THOMAS	Ch. Eng. Marquette & Mackinaw R. R., Marquette, Mich.	Dec. 3, 1879
McLAIN, LOUIS R.	Div. Eng. Richmond & Danville Ex. Co., Oxford, Ala.	Feb. 2, 1881
McMATH, ROBERT E.	3702 Page ave., St. Louis, Mo.	Mar. 3, 1880
McMILLAN, CHARLES	Prof. of Engineering, College of New Jersey, Princeton, N. J.	Jan. 29, 1868
McNAIR, THOMAS S.	Res. Eng. Lehigh Valley R. R., Hazleton, Pa.	July 2, 1873
McNULTY, GEORGE W.	Ass't Eng. East River Bridge, 21 Water st., Brooklyn, N. Y.	May 5, 1880
MEIER, EDWARD D.	214 Pine st., St. Louis, Mo.	Feb. 4, 1880
MEIGS, MONTGOMERY	U. S. Civil Engineer, (in chg. Des Moines Rapids Canal, Keokuk, Ia.	Mar. 5, 1879
MELVIN, DAVID N.	Eng. and Sup't Am. Linoleum Mfg. Co., New Springville, Richmond Co., N. Y.	June 3, 1878
MENDELL, GEORGE H.	Lt.-Col. Corps of Engineers, Bvt. Col. U. S. A., San Francisco, Cal.	Sept. 6, 1876



Name.	Address.	Date of Membership.
MENOCAL, ANICETO G.	Civil Engineer, U. S. N., Washington D. C.	Feb. 3, 1875
MERCUR, FREDERICK	Sup't Luzerne Coal and Iron Co., Wilkesbarre, Pa.	July 20, 1870
MERIWETHER, NILES	City Engineer, Memphis, Tenn.	Nov. 1, 1871
MERRILL, WILLIAM E.	Maj. Corps of Engineers, Bvt. Col. U. S. A., 82 W. 3d st., Cincinnati, Ohio.	Oct. 16, 1872
MERRILL, WILLIAM F.	Ass't. Gen. Supt. Wabash, St. L. & P. R. R., St. Louis, Mo.	April 1, 1874
METCALF, WILLIAM	Crescent Steel Works, 339 Liberty st., Pittsburg, Pa.	July 2, 1873
MEYER, THOMAS C.	9 Waverly Place, New York City, N. Y.	Dec. 7, 1852
MICHAELIS, OTHO E.	Capt. Ordnance Corps, U. S. A., Frankford Arsenal, Philadelphia, Pa.	May 6, 1874
MILLER, REUBEN	81 Wood st., Pittsburg, Pa.	Sept. 1, 1875
MITCHELL, HENRY	Chief of Physical Hydrography, U. S. Coast Survey, 1 Ellis st., Roxbury Station, Boston, Mass.	Jan. 7, 1880
MONROE, J. ALBERT	Div. Eng. New York, West Shore & Buffalo R. R., Kingston, N. Y.	Sept. 15, 1869
MOORE, CHARLES E	Ass't Eng. St. Louis, Jerseyville & Springfield R. R., Jerseyville, Ill.	Jan. 7, 1880
MOORE, JAMES	Ch. Eng. Central R. R. of New Jersey, Elizabeth, N. J.	Dec. 4, 1867
MOORE, ROBERT	Civil Engineer, 102 N. Fourth st., St. Louis, Mo.	April 5, 1876
MORISON, GEORGE S.	35 Wall st., New York City, N. Y.	Jan. 6, 1875
MORRIS, HENRY G.	Mechanical Engineer, 209 S. Third st., Philadelphia, Pa.	Dec. 4, 1867
MORRIS, MARSHALL	Ch. Eng. C. & I. Div. I., N. A. & C. R. R., 530 W. Walnut st., Louisville, Ky.	Mar. 5, 1873
MORRIS, ROBERT C.	Res. Eng. Nashville, Chatanooga & St. Louis R. R., Nashville, Tenn.	Jan. 7, 1874
MORSE, HENRY G.	Morse Bridge Co., Youngstown, Ohio.	April 7, 1880
MORSE, BENJAMIN F.	City Civil Engineer, Cleveland, Ohio.	July 12, 1877
MORSE, JAMES O.	76 John st., New York City, N. Y.	Feb. 9, 1853
MORSS, FOSTER	Ch. Eng. Shenandoah Valley R. R., Hagerstown, Md.	Nov. 6, 1872
MUNKOE, HENRY S.	School of Mines, Columbia College, 49th st. and Fourth ave., New York City, N. Y.	May 4, 1881
MURDOCH, GILBERT	Engineer Sewerage and Water Works, St. John, New Brunswick.	Sept. 7, 1881
MYERS, CHARLES H.	Ass't Eng. Dept. Public Works, 31 Chambers st., New York City, N. Y.	Aug. 5, 1868

Name.	Address.	Date of Membership.	
NEILSON, CHARLES	Sup't Delaware Div. N. Y., L. E. & W. R. R., Port Jervis, N. Y.	Jan.	7, 1880
NEILSON, ROBERT	Gen. Sup't P. & E. Div. P. R. R. and S. and E. & C. Divs. Northern Central Ry., Williamsport, Pa.	Feb.	17, 1869
NEWELL, JOHN	Gen'l Mang. Lake Shore and Mich. Southern R. R., 364 Ontario st., Chicago, Ill.	Jan.	29, 1868
NEWMAN, ROBERT M.	Engineer Jamestown Branch, Jamestown, Dakota.	May	6, 1874
NEWTON, ISAAC	Ch. Eng. Dept. Public Works, 109 E. 15th st., New York City, N. Y.	Mar.	3, 1880
NEWTON, WILLIAM H.	490 Webster ave., Chicago, Ill.	Jan.	7, 1876
NICHOL, JOHN	171 La Salle st., Chicago, Ill.	April	5, 1876
NICHOLS, AURIN B.	Sup't Reynoldsville Mining and Mfg. Co., Reynoldsville, Pa.	Jan.	7, 1880
NICHOLS, OTHNIEL F.	Res. Eng. Henderson Bridge, Henderson, Ky.	June	7, 1876
NICHOLS, WILLARD A.	1st Ass't Eng. Dept. of Docks, 119 Duane st., New York City, N. Y.	May	7, 1873
NICHOLSON, GEORGE B.	Eng. South. Div. New Orleans & North Eastern R. R., 9 Carondelet st., New Orleans, La.	May	1, 1878
NICOLLS, WILLIAM J.	P. O. Box 84, Pottstown, Pa.	June	5, 1878
NOBLE, ALFRED	U. S. Ass't Engineer, 26 Washing- ton ave., Detroit, Mich.	{ J. Sept. 2, 1874 M. April 3, 1878	
NORMAN, GEORGE H.	343 Beacon st., Boston, Mass.	Feb.	19, 1869
NORTH, EDWARD P.	(Care of Am. Soc. C. E.) 127 East 23d st., New York City, N. Y.	Dec.	4, 1867
OCKERSON, JOHN A.	2828 Washington ave., St. Louis, Mo.	July	7, 1880
OLNEY, LA FAYETTE,	Middletown, N. Y.	Oct.	7, 1868
OPDYKE, STACY B., JR.	Eng. New Haven and Northampton Co., 271 Chapel st., New Haven, Conn.	Feb.	2, 1876
OSGOOD, JOSEPH O.	Ch. Eng. California Southern { R. R., San Diego, Cal.	{ J. May 3, 1876 M. Mar. 5, 1879	
OWEN, JAMES	721 Broad st., Newark, N. J.	Sept.	15, 1869
PACKARD, RALPH G.	361 Fulton st., Brooklyn, N. Y.	Feb.	17, 1869
PAINE, CHARLES	Gen. Mang. New York, West Shore & Buffalo R. R., Mills Bldg., 15 Broad st., New York City, N. Y.	Dec.	4, 1867
PAINE, WILLIAM H.	Ass't. Eng. East River Bridge, 21 Water st., Brooklyn, N. Y.	May	12, 1875
PALMER, FRANCIS I.	68 Wall st., New York City, N. Y.	Dec.	1, 1880

Name.	Address.	Date of Membership.
PARENT, ETIENNE H.	Supt. Eng. of Canals, 27 Common st., Montreal, Canada.	Sept. 7, 1881
PARKHURST, HENRY W.	First Ass't Eng. Bismarck Bridge, Bismarck, Dakota.	Sept. 5, 1877
PEARSONS, GALEN W.	Kansas City, Mo.	Jan. 6, 1875
PERKINS, CHARLES P.	Eng. Phila. & Erie R. R. Div. P. R. R., and Susquehanna, Shamokin, Elmira & Canandaigua Div. N. C. Ry., Williamsport, Pa.	J. Feb. 3, 1875 M. April 5, 1882
PETERSON, PETER A.	Ch. Eng. Atlantic & Northwest Ry., Montreal, Canada.	Jan. 5, 1876
PETTIT, HENRY	209 South 3d st., Philadelphia, Pa.	Jan. 7, 1874
PETTIT, ROBERT E.	Prin. Ass't Eng. Penna. R. R. Div. P. R. R. Co., Altoona, Pa.	Nov. 1, 1876
PHILBRICK, EDWARD S.	12 West st., Boston, Mass.	May 6, 1874
PHILBRICK, PHILETUS H.	Professor Civil Engineering, State University of Iowa, Iowa City, Iowa.	Sept. 6, 1876
PICKETT, WILLIAM D.	Bozeman, Montana.	July 6, 1853
PLYMPTON, GEORGE W.	151 Macon st., Brooklyn, N. Y.	Jan. 29, 1868
POE, ORLANDO M.	Major Corps of Engineers, Bvt. Brig.-Gen. U. S. A., Headquarters of the Army, Washington, D. C.	Jan. 8, 1873
POPE, WILLARD S.	Pres. Detroit Bridge and Iron Works, Detroit, Mich.	Aug. 7, 1872
POST, ANDREW J.	102 Broadway, New York City, N. Y.	Nov. 22, 1871
POST, JAMES C.	Captain of Engineers U. S. A., Jacksonville, Fla.	Feb. 6, 1878
POST, LEVI W.	Lock Box 18, Memphis, Tenn.	Mar. 5, 1873
POTTS, JOSEPH D.	Pres. Erie and Western Transportation Co., 234 South 4th st., Philadelphia, Pa.	Aug. 5, 1868
POTTS, RICHARD	Div. Eng. Dept. of Sewers, Chicago, Ill.	June 1, 1870
PREVOST, SUTHERLAND M.	Sup't Phila. Div. Penna. R. R., West Philadelphia, Pa.	Jan. 6, 1875
PRINDLE, FRANKLIN C.	Civil Engineer U. S. N., U. S. Navy Yard, New York, N. Y.	Mar. 4, 1874
PRIOR, CHARLES H.	Supt. I. & M. Div. Chicago, Milwaukee & St. Paul Ry., St. Paul, Minn.	Mar. 1, 1882
PROBASCO, SAMUEL R.	Ass't Eng. East River Bridge, 279 Front st., New York City, N. Y.	Nov. 18, 1868
PROUT, HENRY G.	12 Barclay st., New York City, N. Y.	A. Nov. 6, 1872 M. Sept. 3, 1879
RADENHURST, WILLIAM N.	Ass't Eng. New York State Canals, Rochester, N. Y.	J. July 7, 1875 M. July 7, 1880
RANDOLPH, JAMES L.	Ch. Eng. Balt. & Ohio R. R., Camden Station, Baltimore, Md.	Mar. 1, 1882
READ, ROBERT L.	57 West 3d st., Cincinnati, O.	Sept. 2, 1874

Name.	Address.	Date of Membership.
REECE, BENJAMIN	Eng. M. S. Div. Lake Shore & Michigan Southern R. R., Toledo, Ohio.	Mar. 2, 1881
REED, EDWARD M.	Vice-Pres't New York, New Haven & Hartford R. R., New Haven, Conn.	July 10, 1872
REED, HORATIO G. H.	Gen'l Sup't & Ch. Eng. Milwaukee, Lake Shore & Western R. R., Milwaukee, Wis.	Oct. 7, 1874
REED, SAMUEL B.	Joliet, Ill.	Oct. 20, 1869
REEVES, DAVID	(Clarke, Reeves & Co.) 410 Walnut St., Philadelphia, Pa.	{ J. April 1, 1874 { M. May 3, 1882
RHODES, BENJAMIN,	Niagara Falls, N. Y.	April, 5, 1882
RICE, EDWARD C.	Ch. Eng. Louisville, New Albany & St. Louis R. R., 3649 Pine st., St. Louis, Mo.	April 7, 1875
RICE, GEORGE S.	Charleston, Arizona.	Feb. 1, 1882
RICHARDS, CHARLES B.	Sup't Southwark Foundry and Machine Co., 430 Washington ave., Philadelphia, Pa.	Aug. 7, 1872
RICHARDSON, HENRY B.	Chief State Engineer, New Orleans, La.	May 7, 1879
RINECKER, FRANCIS	Rieneck, Bavaria Germany.	Aug. 7, 1872
RIVES, ALFRED L.	Gen'l Mang. Mobile & Ohio Railroad, Mobile, Ala.	Sept. 4, 1872
ROBINSON, ALBERT A.	Topeka, Kansas.	May 5, 1880
ROCKWELL, SAMUEL	P. O. Box J, Kansas City, Mo.	Jan. 7, 1880
RODD, THOMAS	Prin. Ass't Engineer, Penna. Co., Pittsburg, Pa.	Jan. 5, 1878
ROEBLING, WASHINGTON A.	Ch. Eng. East River Bridge, Brooklyn, N. Y.	Feb. 17, 1869
ROGERS, FAIRMAN	202 W. Rittenhouse Square, Philadelphia, Pa.	May 7, 1873
ROTCH, WILLIAM	Treas. Connotton Valley Ry. Co., 13 Exchange st., Boston, Mass.	Mar. 5, 1873
ROTHWELL, RICHARD P.	27 Park Place, New York City, N. Y.	Jan. 29, 1868
ROWLAND, THOMAS F.	Continental Iron Works, Greenpoint, N. Y.	Dec. 4, 1867
SANDERSON, J. GARDNER	Room 77, Tribune Bldg., New York City, N. Y.	July 6, 1881
SAVAGE, ALBERT C.	City Engineer, El Paso, Texas.	May 4, 1881
SCHMIDT, MAX O. E.	(Care James Harrington.) Tampico, Mexico.	May 7, 1879
SCOVILL, E. TRACY	337 Euclid ave., Cleveland, Ohio.	Sept. 6, 1876
SEARLES, WILLIAM H.	Newburgh, N. Y.	July 2, 1873
SEARS, ALFRED F.	Ass't Gen. Man. Mexican Central R.R., City of Mexico, Mexico.	June 2, 1869
SEARS, CLINTON B.	Capt. Corps of Engs. U. S. A., Executive officer, Miss. Riv. Commission, 2828 Washington ave., St. Louis, Mo.	Jan. 5, 1876

Name.	Address.	Date of Membership.
SEELY, THOMAS J.	Div. Supt. Atchison, Topeka & Santa Fé R. R., Las Vegas, N. M.	Feb. 1, 1882
SEDGWICK, THOMAS S.	Land Agent, Atlantic & Pacific R.R. Co., New Albuquerque, N. M.	July 20, 1870
SELLERS, COLEMAN	3301 Baring st., Philadelphia, Pa.	May 3, 1876
SELLERS, WILLIAM	1819 Vine st., Philadelphia, Pa.	May 3, 1876
SEWALL, JOSEPH S.	St. Paul, Minn.	July 7, 1875
SEYMOUR, CHARLES	Res. Eng. New York, Chicago & St. Louis R. R., Vermillion, Ohio.	Sept. 6, 1871
SEYMOUR, HORATIO, JR.	Marquette, Mich.	{ A. Jan. 3, 1873 M. April 7, 1880
SHAILER, ROBERT A.	Ass't Sup't Edgmoor Iron Co., Wilmington, Del.	Mar. 3, 1880
SHEDD, J. HERBERT	65 Westminster st., Providence, R. I.	Sept. 15, 1869
SHELDON, SIMEON	Cleveland, Ohio.	Feb. 5, 1873
SHINN, WILLIAM P.	Vice-Pres't New York Steam Co., 16 Cortlandt st., New York City, N. Y.	Sept. 15, 1869
SHREVE, SAMUEL H.	31 East 31st st., New York City, N. Y.	May 19, 1869
SICARD, MIRTILIANO	Ibague, Tolimo, U. S. Colombia.	Jan. 4, 1882
SICKELS, THEOPHILUS E.	Consulting Engineer Union Pacific R.R. 197 Broadway, New York City, N. Y.	Feb. 21, 1872
SIMPSON, GEORGE H.	New York, Lackawanna & Western R. R., Dansville, N. Y.	Oct. 6, 1880
SITES, WILMON W. C.	Ch. Eng. Board of Public Works, Jersey City, N. J.	Nov. 6, 1878
SKILTON, GEORGE S.	City of Mexico, Mexico,	Sept. 7, 1881
SLATAPER, FELICIAN	Ch. Eng. Pennsylvania Co., Pittsburg, Pa.	Sept. 15, 1869
SMEDLEY, SAMUEL L.	Ch. Eng. and Surveyor, City Hall, Philadelphia, Pa.	Sept. 2, 1874
SMITH, CHARLES A.	Washington University, St. Louis, Mo.	April 7, 1880
SMITH, CHARLES C.	Ch. Eng. St. Paul, Milwaukee & Manitoba R. R., St. Paul, Minn.	July 10, 1872
SMITH, C. SHALER	918 Garrison ave., St. Louis, Mo.	Mar. 5, 1873
SMITH, C. VANDERVOORT	Ch. Eng. Manhattan Gas Light Co., foot West 18th st., New York City, N. Y.	July 5, 1876
SMITH, FREDERICK H.	13 German st., Baltimore, Md.	Feb. 21, 1872
SMITH, HAMILTON, JR.	320 Sansom st., Room 24, San Francisco, Cal.	Feb. 5, 1879
SMITH, ISAAC W.	Ch. Eng. O. P. R. R., Corvallis, Oregon.	Oct. 1, 1873
SMITH, JOSEPH S.	410 Walnut st., Philadelphia, Pa.	April 1, 1874
SMITH, LUCIUS A.	Continental Iron Works, Greenpoint, N. Y.	May 7, 1873
SMITH, T. GUILFORD	Buffalo, N. Y.	Sept. 6, 1871
SMITH, WM. SOOY	Maywood, Ill.	Jan. 17, 1872

Name.	Address.	Date of Membership.
SOULE, HOWARD	Syracuse, N. Y.	Mar. 17, 1866
SPIELMANN, ARTHUR	Civil Engineer, 13 Newark st., Hoboken, N. J.	{ A. Mar. 5, 1873 M. Sept. 5, 1877
STALEY, CADY	Prof. Engineering, Union College, Schenectady, N. Y.	Mar. 17, 1869
STANLEY, IRA N.	88 Van Dyke st., Brooklyn, N. Y.	June 17, 1868
STANTON, ROBERT B.	Div. Eng. U. P. R. R., Union Depot, Room S, Denver Col.	Sept. 1, 1880
STAUFFER, DAVID McN.	Phila. Bridge Works, 259 South Fourth st., Philadelphia, Pa.	Sept. 2, 1874
STEARNS, FREDERICK P.	Ass't Engineer Imp. Sewerage Works, Atlantic, Mass.	Oct. 2, 1878
STEPHENS, CLINTON F.	Ch. Eng. Texas & St. Louis R. R., Pine Bluff, Ark.	Sept. 5, 1877
STRIEDINGER, JULIUS H.	Ch. Eng. Magdalena River Improve- ment, Barranquilla, U. S. of Colom- bia.	Feb. 2, 1876
STROBEL, CHARLES L.	Keystone Bridge Co., Pittsburg, Pa.	Dec. 3, 1879
STRONG, CHARLES H.	1046 Wilson ave., Cleveland O.	Jan. 8, 1873
SWAN, CHARLES H.	25 Wabon st., Highlands, Boston, Mass.	Mar. 16, 1870
SWEET, CHARLES A.	Eng. Mex. Cent. R. R., Leon, Mexico.	Mar. 3, 1880
SWEET, EBNATHAN, JR.	16 Exchange Place, New York City, N. Y.	Nov. 6, 1878
SWEET, WILLIAM A.	Gen'l Manager Sanderson Bros. Steel Co., Syracuse, N. Y.	Feb. 2, 1876
SWIFT, McREE	Pres't Patent Water and Gas Pipe Co., New Brunswick, N. J.	Nov. 6, 1852
SYMINGTON, WILLIAM N.	P. O. Box 2011, New York City, N. Y.	May 4, 1881
TALCOTT, COOK	37 Lafayette st., Newark, N. J.	April 15, 1868
TALCOTT, E. N. KIRK	Prin. Military Academy, Morgan Park, Cook Co., Ill.	Jan. 29, 1868
THACHER, EDWIN	Keystone Bridge Co., Pittsburg, Pa.	Feb. 17, 1869
THOMAS, JOSEPH R.	Eng. Williamsburg Gas Works, Brook- lyn, N. Y.	Oct. 5, 1881
THOMPSON, WILLIAM G. M.	Resident Eng., Welland Canal En- largement, Welland, Canada.	July 2, 1879
THORNDIKE, JOHN L.	Arequipa, Peru. (Care of W.W. Evans, 66½ Pine st., New York City, N. Y.)	May 7, 1873
THURSTON, ROBERT H.	Prof. Mech. Engineering, Stevens In- stitute of Technology, Hoboken, N. J.	Dec. 6, 1871
TIDD, MARSHALL M.	Civil Engineer, 46 Court st., Boston, Mass.	Oct. 2, 1878
TINGLEY, GEORGE C.	21 South Main st., Providence, R. I.	Sept. 6, 1871
TINTORER, JOSE GIBERGA	Asalto No. 12, Barcelona, Spain.	May 5, 1880

Name.	Address.	Date of Membership.
TITLOW, J. MILTON	Prin. Ass't Eng. Dept. of Surveys, City Hall, Philadelphia, Pa.	Aug. 6, 1879
TOWLE, STEVENSON	Eng. in Charge of Sewers, Dept. Pub. Works, 25 Chambers st., New York City, N. Y.	Feb. 19, 1868
TRAFTON, GILMAN	Eng. Louisville Bridge and Iron Co., Louisville, Ky.	May 15, 1872
TRUESDELL, CHARLES	Syracuse, N. Y.	Sept. 15, 1869
TURNER, EDMUND	Eng. Logansport, Crawfordsville & Southwestern Ry., Crawfordsville, Ind.	Feb. 21, 1872
UNTHANK, ACHILLES W.	Tucson, Arizona.	July 2, 1873
VAN BROCKLIN, MARTIN	Oneida, N. Y.	Jan. 7, 1880
VAN BUREN, JOHN D., JR.	Newburg, N. Y.	May 20, 1868
VAN BUREN, ROBERT	Ch. Eng. Dept. City Works, 153 Remsen st., Brooklyn, N. Y.	June 17, 1868
VANCE, HART	U. S. Ass't Engineer, 1351 Washington ave., St. Louis, Mo.	July 7, 1880
VANDERPOOL, EUGENE	Eng. and Sup't Newark Gas Light Co., Newark, N. J.	Sept. 2, 1874
VAN HORNE, JOHN G.	5 Cortlandt st., Room 77, New York City, N. Y.	Feb. 4, 1880
VAN WINKLE, EDGAR B.	Eng. Dept. Public Parks, 117 E. 70th st., New York City, N. Y.	Dec. 2, 1868
VAUGHAN, FREDERICK W.	Pres't L. Bridge & Iron Co., and Ch. Eng. Henderson Bridge Co., Louisville, Ky.	Feb. 17, 1869
VEAZIE, JOSEPH	U. S. Ass't Eng., P. O. Box 209, Boston, Mass.	May 3, 1876
WADDELL, JOHN A. L.	Prof. Civil Engineering, University of Tokio, Japan.	Oct. 5, 1881
WAITE, CHRISTOPHER C.	Ass't to Pres't N. Y., L. E. & W. R. R., 21 Cortlandt st., New York City, N. Y.	Mar. 3, 1880
WALKER, JOHN S.	Huntsville, Ala.	Jan. 5, 1881
WALKER, WILLIAM W.	Gen. Sup't St. Louis, Hannibal & Keokuk R. R., Hannibal, Mo.	Oct. 6, 1880
WALLING, HENRY F.	U. S. Coast and Geodetic Survey Office, Washington, D. C.	May 6, 1868
WARD, CHARLES D.	Windsor Hotel, Jersey City, N. J.	Mar. 3, 1869
WARD, LEBBEUS B.	Windsor Hotel, Jersey City, N. J.	Mar. 16, 1870

Name.	Address.	Date of Membership.
WARE, R. WILLARD	Res. Eng. N. Y., L. E. & W. R. R., Port Jervis, N. Y.	April 1, 1874
WARFIELD, ALBERT G., JR.	Oakdale, Florence P. O., Howard Co., Md.	Oct. 4, 1876
WEEKS, HARVEY R.	Div. Eng. Cin. South.Ry., Chattanooga, Tenn.	Mar. 5, 1873
WEIR, CHARLES G.	Eng. Milwaukee, Lake Shore & Western R. R., Ontonagon, Mich.	May 5, 1880
WEIR, FREDERICK C.	Burnet House, Cincinnati, Ohio.	Aug. 7, 1872
WELCH, ASHBEL	(President.) Lambertville, N. J.	Aug. 7, 1872
WELLINGTON, ARTHUR M.	Ass't Gen. Man. Mexican Central R.R., 5 Plazuela de San Fernando, City of Mexico, Mexico.	May 4, 1881
WELLMAN, DAVID W.	U. S. Ass't Engineer in chg. Survey Missouri River, 1351 Washington ave., St. Louis, Mo.	Oct. 5, 1870
WESTON, THEODORE	Civil Engineer and Architect, 120 Broadway, New York City, N. Y.	Dec. 4, 1867
WHINERY, SAMUEL	Div. Eng. North Div. New Orleans { & N. E. R. R., Meridian, Miss. {	J. April 1, 1874 M. May 4, 1881
WHITCOMB, HENRY D.	U. S. Ass't Eng. James River Improve- ment, Richmond, Va.	Feb. 21, 1872
WHITE, W. HOWARD	Ass't Ch. Eng. Chicago, Burlington & Quincy R. R., Burlington, Iowa.	Mar. 5, 1873
WHITELAW, JOHN	Sup't and Eng. Waterworks, Clevel- land, O.	Feb. 5, 1873
WHITFORD, OSCAR F.	Jameston, Boulder Co., Col.	Dec. 6, 1871
WHITMAN, THOMAS J.	Water Commissioner, St. Louis, Mo.	Jan. 29, 1868
WHITNEY, JOSEPH	Cambridge, Mass.	July 10, 1872
WHITTEMORE, DON J.	Ch. Eng. Chicago, Milwaukee & St. Paul R. R., Milwaukee, Wis.	July 10, 1872
WHITTEN, NATHAN H.	Eng. Holyoke Machine Co., Holyoke, Mass.	Jan. 7, 1876
WIGHTMAN, HENRY M.	City Eng., City Hall, Boston, Mass.	April 2, 1837
WILDER, FRANCIS M.	Sup't Motive Power, N. Y., L. E. & W. R. R., Susquehanna Depot, Pa.	Jan. 5, 1881
WILEY, WILLIAM H.	15 Astor Place, New York City, N. Y.	Feb. 17, 1867
WILSON, HENRY W.	Ass't to Eng. Bridges and Buildings, Penn. R. R., 435 Chestnut st., Phila- delphia, Pa.	Sept. 6, 1876
WILSON, JOHN A.	Civil Engineer, 435 Chestnut st., Phila- delphia, Pa.	June 7, 1876
WILSON, JOSEPH M.	435 Chestnut st., Philadelphia, Pa.	April 2, 1873
WILSON, WILLIAM W.	Ch. Eng. Water Works, Yonkers, N. Y.	Jan. 5, 1870
WIMMER, SEBASTIEN	71 Broadway, New York City, N. Y.	Mar. 2, 1881
WISNER, GEORGE Y.	U. S. Ass't Engineer, 2828 Washington ave., St. Louis, Mo.	April 5, 1876



Name.	Address.	Date of Membership.
WOOD, DE VOLSON	Prof. Mathematics and Mechanics, Stevens Institute of Technology, Hoboken, N. J.	Jan. 17, 1872
WOOD, JOSEPH	Sup't Motive Power, Penna. Co., Fort Wayne, Ind.	April 1, 1874
WORTHEN, WILLIAM E.	63 Bleecker st., New York City, N. Y.	Dec. 4, 1867
WROTNOWSKI, ARTHUR F.	Eng. Harbor Improvements, Vera Cruz, Mexico.	July 12, 1877
WURTELE, ARTHUR S. C.	Ass't Eng. New York Central & Hud- son River R. R., 60 Chestnut st., Albany, N. Y.	Mar. 5, 1873
YARDLEY, EDMUND	Master of Road, Pittsburg Div. B. & O. R. R., Connelsville, Pa.	Sept. 15, 1869
YONGE, SAMUEL H.	Ass't U. S. Engineer, P O. Box 56, St. Charles, Mo.	May 5, 1880

MEMBERS, 532.

## ASSOCIATES.

Name.	Address.	Date of Membership.
ANDREWS, EDWARD R.	Hayford Creosoting Works, 10 Warren st., New York City, N. Y.	June 5, 1878
BAUMANN, EDWARD	Architect, Metropolitan Block, Chi- cago, Ill.	June 2, 1880
BEARDSLEY, ARTHUR	Prof. of Mechanics and Engineering, Swarthmore College, Delaware Co., Pa.	Sept. 1, 1875
BELCHER, GEORGE C. W.	2646 Washington ave., St. Louis, Mo.	May 5, 1880
BRADBURY, HENRY R.	Mang. Neuchatel Asphalte Co., 54 Astor House, New York City, N. Y.	July 1, 1881
BROWN, JACOB B.	Care of Oliver Reed, Newport, R. I.	Sept. 6, 1871
BURR, WILLIAM H.	Rensselaer Polytechnic Institute, { Troy, N. Y.	{ J. June 4, 1874 A. May 5, 1880
COMPTON, ALFRED G.	Prof. of Applied Mathematics, College City of New York, New York City, N. Y.	Sept. 5, 1877

Name.	Address.	Date of Membership.
DAVIS, EMORY C.	Northampton, Mass.	Dec. 4, 1872
DU BARRY, EDMUND L.	621 Pennsylvania ave., N. W., Washington, D. C.	Jan. 6, 1875
FLETCHER, ROBERT	Prof. of Civil Engineering, Thayer School of Civil Engineering, Dartmouth College, Hanover, Grafton Co., N. H.	Nov. 4, 1874
FROST, GEORGE H.	Prop. of <i>Engineering News</i> , New York City, N. Y.	Jan. 4, 1882
GORDON, ALEXANDER	Secretary Niles Tool Works, Hamilton, Ohio.	Mar. 5, 1879
GORRINGE, HENRY H.	Lt.-Comdr. U. S. N., 32 Waverly Place, New York City, N. Y.	April 6, 1881
HADDOCK, ARBA R.	410 East 14th st., New York City, N. Y.	May 4, 1881
HAMMOND, HENRY B.	Pres't Indianapolis, Decatur & Springfield Ry., 120 Broadway, New York City, N. Y.	July 7, 1880
HARDY, ARTHUR S.	Prof. of Mathematics, Dartmouth College, Hanover, N. H.	April 4, 1877
HARRIS, CHARLES M.	Care of Parsons & Co., 42 Pine st., New York City, N. Y.	Jan. 8, 1873
HENDRIE, JOHN S.	Eng. Detroit, Mackinaw & Marquette R. R., Marquette, Mich.	Sept. 7, 1881
LAWSON, LEONIDAS M.	102 Broadway, New York City, N. Y.	Dec. 3, 1879
LOCKWOOD, JOHN	Gas and Hydraulic Eng., 61 Broadway, New York City, N. Y.	April 5, 1882
PUTNAM, JOSEPH W.	Box 2734, New Orleans, La.	Mar. 3, 1880
RICHARDS, JOSEPH R.	46 Court st., Boston, Mass.	Feb. 4, 1880
ROBERTS, PERCIVAL, JR.	Pencoyd Iron Works, 265 South 4th st., Philadelphia, Pa.	May 7, 1879
WATKINS, CHARLES D.	118 E. 115th st., New York City, N. Y.	Mar. 5, 1873
WATSON, WILLIAM	107 Marlborough st., Boston, Mass.	Mar. 1, 1882
WHEATON, EDWARD	Care Wm. Frazier & Co., 64 Equitable Building, Boston, Mass.	Mar. 3, 1880

ASSOCIATES, 27.

## JUNIORS.

Name.	Address.	Date of Membership.
ABBOTT, ARTHUR V.	9 Middagh st., Brooklyn, N. Y.	Jan. 5, 1881
ALLAIRE, WILLIAM M.	Engineer for U. S. Electric Lighting Co., 358 West 32d st., New York City, N. Y.	Mar. 2, 1881
ALLEN, JAMES P.	Charleston, S. C.	Mar. 5, 1879
BALDWIN, WARD	Ass't Eng. Cin. South. Ry., 134 Vine st., Cincinnati, Ohio.	Mar. 2, 1881
BOGART, JAMES P.	Eng. Conn. Shell Fishery Commission, New Haven, Conn.	Jan. 4, 1882
BOWDITCH, ERNEST W.	60 Devonshire st., Boston, Mass.	Feb. 3, 1875
BROOKS, FREDERICK	Office Mexican Central Ry., Tampico, Mexico.	June 7, 1876
BROWN, THOMAS E., JR.	337 West 34th st., New York City, N. Y.	Nov. 3, 1880
BULLOCK, WILLIAM D.	Ass't Eng. in chg. of Bridges, City Engineer's Office, Providence, R. I.	Sept. 5, 1877
BURDETT, CHARLES L.	Care of Gen. Theo. G. Ellis, Hartford, Conn.	Jan. 6, 1875
BURNHAM, GEORGE, JR.	2211 Greene st., Philadelphia, Pa.	Jan. 6, 1875
BUTTS, EDWARD	Ass't. Eng. Union Pacific R. R., Room S, Union Depot, Denver, Col.	April 6, 1881
CLARK, IRA E.	Davisville, Yolo Co., Cal.	Feb. 6, 1878
CORNELL, GEORGE B.	46 West 48th st., New York City, N. Y.	Aug. 6, 1879
CRANDALL, CHARLES L.	Ass't Professor of Civil Engineering, Cornell University, Ithaca, N. Y.	June 7, 1876
CROSBY, BENJAMIN L.	Ass't Eng. Bismarck Bridge, Bismarck, Dakota.	June 2, 1880
CURTIS, WENDELL R.	Ass't Eng. in charge of Bridging, Cal. South. R. R., San Diego, Cal.	March 3, 1875
DAVIS, JOSEPH B.	Ann Arbor, Mich.	April 1, 1874
DAY, G. FREDERIC P.	Ass't Eng. Fitchburg R. R., Fitchburg, Mass.	Nov. 3, 1880
DUBOIS, A. JAY	Professor of Dynamical Engineering, Sheffield Scientific School, New Haven, Conn.	July 7, 1875

Name.	Address.	Date of Membership.
EMONTS, WILLIAM A. G.	3909 Pine st., Philadelphia, Pa.	Sept. 6, 1876
FERGUSON, JOHN W.	Ass't Eng. New York, Lake Erie & Western Ry., Hornellsville, N. Y.	Feb. 2, 1881
FERRY, CHARLES A.	18 City Hall, New Haven, Conn.	May 4, 1881
FOX, S. WATERS	1351 Washington ave., St. Louis, Mo.	July 7, 1880
FRANCIS, HENRY N.	City Hall, Providence, R. I.	Mar. 1, 1876
GATES, CHRISTOPHER L.	Ass't Eng. Chicago, Milwaukee & St. Paul R. R., Milwaukee, Wis.	Dec. 4, 1878
GILLESPIE, J. L.	P. O. Box 2127, St. Paul, Minn.	Feb. 3, 1875
HAINES, CASPAR W.	Cheltenham, Montgomery Co. Pa.	Feb. 2, 1876
HAVILAND, ARTHUR	Ass't Eng. Tehuantepec R. R., Jaltipan, Mexico.	Jan. 4, 1882
HAYES, EDMUND	Eng. Central Bridge Works, Buffalo, N. Y.	Mar. 6, 1878
HILL, ALBERT B.	First Ass't City Engineer, 18 City Hall, New Haven, Conn.	Feb. 2, 1876
HOLBROOK, FRANCIS N.	Sup't Corralitos Mining Co., Corralitos, Mexico.	March 2, 1881
HORTON, SANDFORD	Peekskill, N. Y.	Feb. 7, 1877
ILLSLEY, WILLIAM A.	Leadville, Col.	Feb. 3, 1875
KELLY, CASSIUS W.	18 City Hall, New Haven, Conn.	Mar. 1, 1882
KELLOGG, NORMAN B.	Care of Fox & Kellogg, 530 California st., San Francisco, Cal.	Feb. 6, 1878
KIMBALL, GEORGE A.	City Engineer, Somerville, Mass.	May 12, 1875
LAFON, THOMAS	Sub-Div. Eng. Mex. Nat. Const. Co., Manzanillo, Mexico.	Mar. 3, 1857
LUCAS, D. JONES	Ass't Eng. P. & L. E. R. R., Lowellville, O.	Sept. 6, 1876
MACY, ARTHUR	609 Lexington ave., New York City, N. Y.	July 12, 1877
MERRIMAN, MANSFIELD	Professor of Civil Engineering, Lehigh University, Bethlehem, Pa.	May 12, 1875
NOYES, ELLIS B.	U. S. Naval Station, New London, Conn.	July 7, 1880

Name.	Address.	Date of Membership.
PEGRAM, GEORGE H.	Edgmoor Iron Co., Wilmington, Del.	April 7, 1880
PIERSON, STEPHEN C.	W. Meriden, Conn.	Nov. 4, 1874
POETSCH, CHARLES J.	Ass't City Eng., Milwaukee, Wis.	May 4, 1881
PRINCE, EDWARD,	Quincy, Ill.	Feb. 6, 1878
RAYMOND, CHARLES WARD	Res. Eng. N. Y. Works, Hudson Tunnel Cons. Co., foot of Morton st., New York City, N. Y.	Nov. 7, 1877
REUSCHEL, WILLIAM	Ass't Eng. Clev. Bridge and Car Works. Cleveland, Ohio.	June 2, 1880
STAATS, ROBERT P.	Ass't Eng. N. Y., L. E. & W. R. R., 187 West st., New York City, N. Y.	Nov. 3, 1875
STAHLBERG, ALBERT J.	O. & C. R. R., Raseburg, Oregon.	Mar. 4, 1874
STEVENS, HORACE E.	U. S. Ass't Eng., U. S. Engineer's Office, St. Paul, Minn.	Nov. 1, 1876
STEWART, HUNTER	2828 Washington ave., St. Louis, Mo.	June 1, 1881
WHITLOCK, FRANK W.	P. O. Box 343 Waterbury, Conn.	Oct. 4, 1876
WHITNEY, FRANK O.	City Hall, Boston, Mass.	May 3, 1876

## JUNIORS, 54.

## FELLOWS.

Name.	Address.	Date of Membership.
AINSLIE, GEORGE	Louisville, Ky.	May 28, 1872
AINSLIE, JAMES W.	Louisville, Ky.	May 28, 1872
BATTERSON, J. G.	Hartford, Conn.	June 7, 1876
BELKNAP, WILLIAM R.	Louisville, Ky.	May 28, 1872
BLATCHFORD, E. W.	375 N. LaSalle st., Chicago, Ill.	Feb. 6, 1873
BOUTON, NATHANIEL S.	Chicago, Ill.	Dec. 30, 1872
BRIDGFORD, JOHN	Albany, N. Y.	Jan. 14, 1871
CASS, GEORGE W.	5 Nassau st., New York City, N. Y.	Mar. 30, 1871
CHANUTE, OCTAVE,*	Ch. Eng. N. Y., L. E. & W. R. R., 21 Cortlandt st., New York City, N. Y.	July 11, 1872

\*Member.

Name.	Address.	Date of Membership.
CHENEY, NATHANIEL	New York City, N. Y.	June 21, 1870
CLARK, EDWARD W.	Philadelphia, Pa.	April 8, 1870
CLARKE, THOMAS C.*	49 William st., Room 58, New York City, N. Y.	May 20, 1872
COCHRAN, A. P.	Louisville, Ky.	June 19, 1872
COIT, EDWARD W.	261 South 4th st., Philadelphia, Pa.	Sept. 20, 1872
COLEMAN, T. C.	Louisville, Ky.	May 28, 1872
COURTWRIGHT, MILTON	55 Broadway, New York City, N. Y.	June 11, 1870
DILLON, SIDNEY	Pres't Union Pacific R. R., 78 Broadway, New York City, N. Y.	Mar. 26, 1870
DIVEN, ALEXANDER S.	Elmira, N. Y.	June 16, 1870
DU PONT, BIDDERMANN	Louisville, Ky.	Sept. 5, 1873
DURANT, THOMAS C.	20 Nassau st., New York City, N. Y.	Nov. 18, 1870
EADS, JAMES B.*	Room 502, Chamber of Commerce, St. Louis, Mo.	Mar 30, 1870
ELLIS, THEODORE G.*	Hartford, Conn.	Nov. 21, 1872
EVANS, WALTON W.*	New Rochelle, N. Y.	Mar. 15, 1879
FARNAM, HENRY	New Haven, Conn.	Nov. 14, 1872
FARREN, B. N.	1731 Spring Garden st., Phila., Pa.	Mar. 12, 1870
FELTON, SAMUEL M.	Penn. Steel Co., 208 South Fourth st., Philadelphia, Pa.	Mar. 23, 1870
FINK, ALBERT*	( <i>Past-President.</i> ) Com'r of Trunk Lines, 346 Broadway, New York City, N. Y.	Sept 3, 1872
FLINT, CHARLES R.	87 Wall st., New York City, N. Y.	June 7, 1876
FRANCIS, JAMES B.*	( <i>Past-President.</i> ) Ch. Eng. Propr's of Locks and Canals on Merrimack River, Lowell, Mass.	May 4, 1870
GILMAN, CHARLES C.	Pres't Hawkeye Telegraph Co., Eldora, Iowa.	May 11, 1871
GURNEE, WALTER S.	New York City, N. Y.	May 10, 1870
HARBAUGH, SPRINGER	Pittsburg, Pa.	May 19, 1871
HARRISON, STEPHEN A.	Railway Contractor, Milwaukee, Wis.	Jan. 30, 1873
HOLMAN, STEPHEN	Holyoke, Mass.	July 11, 1872
HOWLAND, GEORGE, JR.	New Bedford, Mass.	June 6, 1870
HUNTINGTON, COLLIS P.	Vice-President Central Pacific R. R., 9 Nassau st., New York City, N. Y.	Mar. 10, 1877

\*Member.

Name.	Address.	Date of Membership.
JERVIS, JOHN B.†	Rome, N. Y.	Mar. 19, 1870
JONES, BENJAMIN F.	Pittsburg, Pa.	June 15, 1870
JOY, JAMES F.	Detroit, Mich.	Nov. 6, 1872
KINGSLEY, WILLIAM C.	Brooklyn, N. Y.	June 6, 1870
KRUPP, FREDERICK	Essen, Prussia.	June 14, 1870
LONG, DENIS	Louisville, Ky.	Mar. 28, 1872
LOWTHORP, FRANCIS C.*	152 Greenwood ave., Trenton, N. J.	Mar. 17, 1870
LYON, WILLIAM M.	Pittsburg, Pa.	Mar. 23, 1870
MERRITT, GEORGE	131 William st., New York City, N. Y.	May 6, 1870
MERZ, FREDERICK W.	74 Green st., Louisville, Ky.	May 28, 1872
NORMAN, GEORGE H.*	343 Beacon st., Boston, Mass.	Mar. 23, 1870
NORTON, FREDERICK O.	92 Broadway, New York City, N. Y.	June 4, 1879
PROSSER, THOMAS	15 Gold st., New York City, N. Y.	June 1, 1870
REED, WILLIAM W.	Erie, Pa.	Dec. 20, 1872
RICHMOND, HENRY A.	Buffalo, N. Y.	July 7, 1870
RUMSEY, B. C.	Buffalo, N. Y.	May 12, 1870
SCOTT, WILLIAM L.	Erie, Pa.	July 7, 1870
SEYMOUR, M. T.	55 Broadway, New York City, N. Y.	July 21, 1870
STEWART, DAVID A.	Pres. Pittsburg Locomotive and Car Works, Pittsburg, Pa.	Nov. 7, 1872
SWIFT, McREE*	Pres. P. W. & G. P. Co., New Brunswick, N. J.	Mar. 9, 1870
TASKER, STEPHEN P. M.	(Morris, Tasker & Co.) Philadelphia, Pa.	Sept. 20, 1872
TAYLOR, WILLIAM J.	Iron Master, Chester, N. J.	May 10, 1870
THAW, WILLIAM	Pittsburg, Pa.	Aug. 30, 1871
TOUCEY, JOHN M.	Grand Central Depot, New York City, N. Y.	May 17, 1870
WALKER, GEORGE C.	228 Michigan ave., Chicago, Ill.	Feb. 6, 1873
WATSON, JAMES	Paterson, N. J.	Dec. 5, 1872
WELTON, NELSON J.	Waterbury, Conn.	Jan. 20, 1873

## FELLOWS, 63.

\*Member. †Honorary Member.

## SUBSCRIBERS TO THE BUILDING FUND.

NOTE.—All contributions to the Building Fund are to be acknowledged from time to time, by printing lists of the same in the monthly Proceedings of the Society, and in addition to this, the names of all those who may subscribe \$100 or more are to be regularly enrolled and published in future lists of the Society under the head of Subscribers to the Building Fund.

ANDREWS, HITCHCOCK & Co.	Cleveland, Ohio.
AYER, H. C.	362 Dearborn St., Chicago, Ill.
BARNARD, JOHN F.	Gen. Sup't K. C., St. J. & C. B. R. R., St. Joseph, Mo.
BELL, H. P.	Care Blanchard & Wilson, Winnipeg, Manitoba.
BILLIN, CHARLES E.	Illiana, Edgar Co., Ill.
BLACKSTONE, T. B.	President Chicago & Alton R. R., Chicago, Ill.
BOLLER, ALFRED P.	71 Broadway, New York City, N. Y.
BOSTON GAS LIGHT CO.	24 West st., Boston, Mass.
BOUSCAREN, LOUIS G. F.	Cons. Eng. Cin. South. Ry., Cincinnati, Ohio.
BOUTON, N. S.	Chicago, Ill.
BOWEN, E. S.	Gen. Sup't N. Y., L. E. & W. R. R., 21 Cortlandt st., New York City, N. Y.
BOYD, CHARLES R.	Wytheville, Va.
BROOKS, FREDERICK	Care Mexican Central Ry., Tampico, Mexico
BROWN, CHARLES O.	52 William st., Room 9, New York City, N. Y.
CABLE, R. R.	Vice Pres't and Gen. Mang. C., R. I. & P. R. R., Rock Island, Ill.
CARNEGIE, ANDREW	Pittsburg, Pa.
CHAMBERLAIN, SELAH	Cleveland, Ohio.
CHANUTE, A.	Box 2819, Leadville, Col.
CHESBROUGH, E. S.	175 LaSalle st., Chicago, Ill.
CHISHOLM, WILLIAM	Pres't Cleveland Rolling Mill, Cleveland, Ohio.
CISNEROS, FRANCIS J.	311 West 33d st., New York City, N. Y.
CLEVELAND CITY FORGE AND IRON CO.	Cleveland, Ohio.
COLLINGWOOD, FRANCIS	279 Front st., New York City, N. Y.
CORTHELL, ELMER L.	Mills Bldg., 15 Broad st., New York City, N. Y.
CORYELL, MARTIN	Lambertville, N. J.
COXE, ECKLEY B.	Drifton, Jeddo P. O., Pa.
CRERAR, JOHN	11 Fifth ave., Chicago, Ill.
CUNNINGHAM, JAMES H.	50 Queen st., Edinburgh, Scotland
DAVIS, JOSEPH P.	28 East 20th st., New York City, N. Y.
DICKINSON, P. P.	237 Broadway, New York City, N. Y.
DRAKE, JOHN H.	Care A. P. Boller, 71 Broadway, New York City, N. Y.
DUNLAP, G. L.	328 Dearborn ave., Chicago, Ill.
EADS, JAMES B.	Room 502, Chamber of Commerce, St. Louis, Mo.
ECKART, WILLIAM R.	P. O. Box 1587, San Francisco, Cal.
EELLS, D. P.	Cleveland, Ohio
EMERY, CHARLES E.	16 Cortlandt st., New York City, N. Y.
FARREN, B. N.	1731 Spring Garden st., Philadelphia, Pa.
FELTON, SAMUEL M.	Pres't Penna. Steel Co., Philadelphia, Pa.



FINK, ALBERT.....	346 Broadway, New York City, N. Y.
FISHER, CHARLES H.....	Ch. Eng. N. Y. C. & H. R. R. R., Albany, N. Y.
FLINT, CHARLES R.....	87 Wall st., New York City, N. Y.
FRANCIS, JAMES B.....	Ch. Eng. Proprs. Locks and Canals, Merrimack River, Lowell, Mass.
GLOVER, OLIVER L .....	Pittsfield, Mass.
GÓODERHAM, W., JR.....	Pres't T. & N. R. R. Toronto, Canada
GOODRIDGE, JOHN C., JR.....	127 East 25th st., New York City, N. Y.
GORRINGE, HENRY H.....	Lieut.-Com. U. S. N., 32 Waverly Place, New York City, N. Y.
HARRIS, HENRIQUE.....	212 Adelphi st., Brooklyn, N. Y.
HARRIS, W. H.....	Cleveland, Ohio.
HASELL, BENTLEY D.,	Pier 27, North River (P.O. Box 2605), New York City, N. Y.
HOLLEY, ALEXANDER L*.....	Brooklyn, N. Y.
HORTON, SANDFORD.....	Ass't Eng. Tehuantepec R. R., Jaltilpan, Mexico.
HYDE, WILLIAM B.....	162 Third st., Oakland, Cal.
JERVIS, JOHN B.....	Rome, N. Y.
KEEFER, THOMAS C.....	Ottawa, Canada.
KELLOGG, CHARLES.....	Athens, Pa.
LEAVITT, ERASMUS D., JR.....	604 Main st., Cambridgeport, Mass.
LEITH, ALEXANDER J.....	Honore Building, Rooms D and E., Chicago, Ill.
LEWIS, EUGENE C.....	Sycamore M'fg Co., Nashville, Tenn.
MACDONALD, CHARLES .....	52 Wall st., New York City, N. Y.
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McFADDEN, CHARLES.....	Andalusia, Bucks Co., Pa.
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METCALF, WILLIAM.....	Pittsburg, Pa.
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NETTLETON, WILLIAM A.....	Phillips Academy, Andover, Mass.
NICHOLSON, GEORGE B.....	9 Carondelet st., New Orleans, La.
NORMAN, GEORGE H.....	343 Beacon st., Boston, Mass.
NORTH, EDWARD P. (Care Am. Soc. C. E.),	127 East 23d st., New York City, N. Y.
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PAYNE, HENRY B .....	Cleveland, Ohio.
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PORTER, H. H.....	432 Dearborn st., Chicago, Ill.
POTTER, O. W.....	532 Dearborn ave., Chicago, Ill.
PRESCOTT, SCOTT & CO.....	P. O. Box 2128, San Francisco, Cal.
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ROBERTS, W. MILNOR*.....	Rio De Janeiro, Brazil.
ROBINSON, A. A.....	Topeka, Kansas.
ROBINSON, MONCURE.....	Philadelphia, Pa.
ROTCH, WILLIAM.....	Jamaica Plain, Mass.
ROWLAND, THOMAS F.....	Continental Iron Works, Greenpoint, N. Y.
SICKELS, THEOPHILUS E. ....	Cons. Eng. U. P. R. R., 197, Broadway, New York City, N. Y.

\*Deceased.

SMITH, C. VANDERVOORT.....	Ch. Eng. Man. Gas Co., foot of West 18th st., New York City, N. Y.
SMITH, WM. ALEXANDER .....	412 Madison ave., New York City, N. Y.
STRANAHAN, J. S. T.....	Brooklyn, N. Y.
SWEET, WILLIAM A.....	Syracuse, N. Y.
SWIFT, MCREE.....	New Brunswick, N. J.
SYKES, M. L.....	52 Wall st., New York City, N. Y.
THAW, WILLIAM.....	Pittsburg, Pa.
TOD, JOHN.....	Cleveland, Ohio
WADE, J. H.....	Cleveland, Ohio
WEIR, FREDERICK C.....	Burnett House, Cincinnati, Ohio
WELCH, ASHBEL.....	Lambertville, N. J.
WHIPPLE, SQUIRE.....	237 State st., Albany, N. Y.
WHITTEMORE, EUGENE.....	Care C., M. & St. P. R. R., Milwaukee, Wis.

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## PAST OFFICERS

### OF THE

## AMERICAN SOCIETY OF CIVIL ENGINEERS.

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### PRESIDENTS.

JAMES LAURIE,\* November 5, 1852, to November 6, 1867.  
 JAMES P. KIRKWOOD,\* November 6, 1867, to August 5, 1868.  
 WILLIAM J. MCALPINE, August 5, 1868, to November 3, 1869.  
 ALFRED W. CRAVEN,\* November 3, 1869, to November 1, 1871.  
 HORATIO ALLEN, November 1, 1871, to November 5, 1873.  
 JULIUS W. ADAMS, November 5, 1873, to November 3, 1875.  
 GEORGE S. GREENE, November 3, 1875, to November 7, 1877.  
 E. S. CHESBROUGH, November 7, 1877, to November 6, 1878.  
 W. MILNOR ROBERTS,\* November 6, 1878, to November 5, 1879.  
 ALBERT FINK, November 5, 1879, to November 3, 1880.  
 JAMES B. FRANCIS, November 3, 1880, to January 18, 1882.  
 ASHBEL WELCH, January 18, 1882.

### VICE-PRESIDENTS.

EDWARD GARDINER,\* November 5, 1852, to November 2, 1853.  
 CHARLES W. COPELAND, November 5, 1852, to November 3, 1869.  
 ALFRED W. CRAVEN,\* November 2, 1853, to November 6, 1867.  
 JULIUS W. ADAMS, November 6, 1867, to November 5, 1873.  
 JAMES B. FRANCIS, November 3, 1869, to November 2, 1870.  
 THOMAS C. CLARKE, November 2, 1870, to November 1, 1871.  
 JACOB M. CLARK, November 1, 1871, to November 5, 1873.

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\*Deceased.

W. MILNOR ROBERTS,\* November 5, 1873, to November 1, 1876.  
 THEODORE G. ELLIS, November 5, 1873, to November 7, 1877.  
 ALEXANDER L. HOLLEY,\* November 1, 1876, to November 7, 1877.  
 ALBERT FINK, November 7, 1877, to November 5, 1879.  
 W. MILNOR ROBERTS,\* November 7, 1877, to November 6, 1878.  
 JAMES B. FRANCIS, November 6, 1878, to November 3, 1880.  
 OCTAVE CHANUTE, November 5, 1879, to January 18, 1882.  
 ASHBEL WELCH, November 3, 1880, to January 18, 1882.  
 WILLIAM H. PAINE, January 18, 1882.  
 JAMES B. EADS, January 18, 1882.

#### SECRETARIES.

ROBERT B. GORSUCH, November 5, 1852, to November 2, 1853.  
 EDWARD GARDINER,\* November 2, 1853, to December 1, 1854.  
 JAMES O. MORSE, December 1, 1854, to November 3, 1869.  
 THOMAS C. MEYER, November 3, 1869, to January 5, 1870.  
 ALFRED P. BOLLER, January 5, 1870, to November 1, 1871.  
 GABRIEL LEVERICH, November 1, 1871, to November 7, 1877.  
 JOHN BOGART, November 7, 1877.

#### TREASURERS.

ROBERT B. GORSUCH, November 5, 1852, to November 2, 1853.  
 EDWARD GARDINER,\* November 2, 1853, to December 1, 1854.  
 JAMES O. MORSE, December 1, 1854, to November 3, 1875.  
 JOHN BOGART, November 3, 1875, to November 7, 1877.  
 J. JAMES R. CROES, November 7, 1877.

#### DIRECTORS.

W. H. MORELL,*	year beginning	November,	1852.
W. H. SIDELL,*	"	"	1852.
JULIUS W. ADAMS,	years	"	1852, 1875.
JAMES P. KIRKWOOD,*	"	"	1852 to Nov. 1867.
ALFRED W. CRAVEN,*	"	"	1852, 1867, 1868, 1871 and 1872.
WILLIAM J. MCALPINE,	years beginning	November, 1853, to Nov.	1867, and Nov. 1869.
WILLIAM H. TALCOTT,*	"	"	1853, to Nov., 1868.
JAMES O. MORSE,	"	"	1853, to Nov., 1867 and Nov., 1876.
J. W. PRATT,*	"	"	1853.
I. C. CHESBROUGH,*	"	"	1854, to Nov., 1867.
JAMES K. FORD,	"	"	1867, 1868.

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\*Deceased.

GEORGE S. GREENE,	year beginning November,	1867, 1868, 1870, 1872, 1874.
		1876, 1877, 1878.
JOHN F. WARD,	" "	1867, 1868, 1869, 1870, 1871.
E. S. CHESBROUGH,	" "	1869.
THOMAS PROSSER,	" "	1869.
JACOB M. CLARK,	" "	1869, 1870.
THOMAS F. ROWLAND,	" "	1870, 1871, 1872.
CHARLES MACDONALD,	" "	1870, 1873, 1874.
ALFRED P. BOLLER,	" "	1871.
WILLIAM E. WORTHEN,	" "	1871.
JOHN BOGART,	" "	1872, 1873, 1874.
F. COLLINGWOOD,	" "	1872, 1873, 1874, 1875.
DE VOLSON WOOD,	" "	1873.
OCTAVE CHANUTE,	" "	1873, 1874, 1875.
A. L. HOLLEY,*	" "	1875.
Q. A. GILLMORE,	" "	1875.
W. MILNOR ROBERTS,*	" "	1876.
J. JAMES R. CROES,	" "	1876.
WILLIAM H. PAINE,	" "	1876, 1877, 1878, 1879, 1880.
M. N. FORNEY,	" "	1876.
JOSEPH P. DAVIS,	" "	1877, 1880. Jan. 1882.
C. SHALER SMITH,	" "	1877.
C. VANDERVOORT SMITH,	" "	1877, 1878, 1879, 1880.
THOMAS C. CLARKE,	" "	1878.
THEODORE G. ELLIS,	" "	1878.
CHARLES HERMANY,	" "	1879.
EDGAR B. VAN WINKLE,	" "	1879.
GOVERNEUR K. WARREN,	" "	1879.
G. BOUSCAREN,	" "	1880.
D. J. WHITTEMORE,	" "	1880.
THOMAS C. KEEFER,	" "	January, 1882.
THOMAS L. CASEY,	" "	1882.
GEORGE S. GREENE, JR.,	" "	1882.
GEORGE W. DRESSER,	" "	1882.

\*Deceased.



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